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**Developing Science, Technology and Innovation (STI) Capacity through
Networks: The Case of a Development Network Organisation in
Mozambique**

A dissertation submitted to the Department of Sociology,

Trinity College Dublin,

for the Degree of Doctor of Philosophy

2013

Il-haam Petersen



Thesis 10300

Declaration

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Summary

Science, technology and innovation (STI) is once again high on the international development agenda (Chataway et al, 2005; Leach and Scoones, 2006). Some authors have highlighted the role of new networked forms of organisation emerging in the field of development as mechanisms through which organisations in resource-poor contexts access useful knowledge and other resources not easily available in the local context (see Chataway et al, 2005). They have thus raised the question: Can these new networked organisational forms be utilised as mechanisms for accelerating STI-capacity development? What is new about these organisational forms is that they are mission-driven and are characterised by high levels of interdependence and interconnectivity. I call these new organisational forms 'development network organisations' (DNOs). In attempting to address this question, I encountered two problems: 1) a paucity of theoretical literature on DNOs and STI, especially in low-income countries in Africa, and 2) a lack of appropriate approaches for analysing these network organisational forms.

In order to address the gap in the empirical literature, I explore the role of an aid-funded DNO in developing optometry-related STI capacity in Mozambique. More specifically, the DNO is explored as one of the strategies a young African university employs for accelerating the expansion of the university and in supporting its efforts in meeting the needs of the local context. A main aim of the DNO was to develop an optometry department at the African university. The DNO consisted of a publicly-funded university in Mozambique, an international NGO based in Africa and two Northern European universities.

In addressing the problem of the lack of suitable analytical approaches, I propose the use of a network-institutional approach, which combines key ideas in the social network analysis and new institutionalist literature, specifically Fligstein and McAdam's (2012) theory of fields. The network-institutional approach was first introduced by Owen-Smith and Powell (2008), who conceptualised networks as transmission systems through which information flows ('pipes') and 'sense-making systems', that is, 'carriers of institutional effects' ('prisms') and social orders in which meaning is negotiated. In combining key ideas in network theory and the theory of fields, I conceptualise DNOs as mesolevel social orders through which information and other useful resources can be transmitted, but also in which strategic collective action takes place. This conception thus moves beyond the understanding of networks as pipes and as 'carriers of institutional effects' (Owen-Smith and Powell, 2008: 595) to an understanding of

networks as social orders in which social life or culture is produced through interaction (Mische, 2011), similar to DiMaggio's 'cultural production systems' (2011: 286-287). The analysis presented in this thesis delves into an exploration of 'measure and meaning' (Edwards and Crossley, 2009). This conception is also closer to Alfred Schutz's and Berger and Luckmann's (1967) understandings of how social life is socially constructed through the everyday lives of individuals.

I utilise mixed methods social network analysis (SNA) to apply the network-institutional approach to the analysis of a case study. The research was conducted in three stages and included quantitative methods of data collection (online survey) and analysis (structural network analysis using Pajek), and qualitative methods of data collection (semi-structured depth interviews and ethnography) and analysis (thematic coding). The data was collected during three periods: May to December 2010, May to December 2011 and May to July 2012.

The research thus lies on the borders of the development, innovation, organisational-institutional and SNA literature. In this thesis, I show the usefulness of the network-institutional approach and mixed methods SNA for understanding the 'inner workings' of a DNO (i.e. opening the 'black box') and the impact of the wider institutional contexts in which it was embedded, and how the DNO worked towards transforming the field of eye care in Mozambique. The approach provides tools for analysing the relations between network structure, the dynamics of relations among actors, network institutions and the social strategies actors employ to bring about co-operation. One significant finding is that the interdependence among actors in the DNO was another currency of power that weakened the power of the traditionally dominant actors in aid-funded DNOs (i.e. those in control of the financial and knowledge resources). Unequal power relations did, however, hinder institution-building and the development of a shared collective identity, which were found to be essential for co-operation. The importance of an effective bridging actor was also highlighted. The main roles of bridging actors during the stage of emergence were to direct and transmit information, but also to engage in sense-making in order to fashion institutions and identities that resonate with others (see Fligstein and McAdam, 2012). The social skill of skilled strategic actors was crucial in stabilising the field and dealing with conflict situations. So, my two key contributions are: to shed light on the role of DNOs in STI capacity building in low-income countries in Africa and also, to shed light on the analytical tools needed to understand the role of such networks in development.

For my parents, without whose support and gentle nudging I would not have gotten this far,
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List of abbreviations

DevAid	Development Aid Agency of the Northern European Country
DNO	Development network organisation
HEA	Higher Education Authority of the Northern European Country
ICT	Information and Communication Technology
MMR	Mixed methods research
MozOptom	The Mozambique Optometry Development Project
Neuro	Northern European Country
NEuroIT	Northern European Institute of Technology
NEuroUni	Northern European University
OptomNGO	Optometry NGO
PCHE	DevAid Programme of Collaboration between Higher Education Institutions
SNA	Social network analysis
STI	Science, technology and innovation
UniUS	The University of Science, Northern Mozambique

Chapter 1 Introduction

In this thesis, the development of science, technology and innovation (STI) capacity in Mozambique, a low-income country in Africa, is explored. STI capacity is currently high on the development agenda of regional and international development agencies (see ATPS, 2010; NEPAD, 2007; UNCTAD, 2008; UNDP, 2005). Mozambique and other low-income countries in Africa have also included the development of STI capacity in their poverty reduction strategy papers (PRSPs) (UNCTAD, 2008). A problem highlighted in the mainstream innovation studies literature is the paucity of theoretical and empirical research on innovation in these countries, and the lack of adequate analytical tools for analysing the role of informal institutions or tacit knowledge (power, cultural values and practices, and informal networks) (Bell, 2009; Lorentzen, 2010; Muchie, 2003). Much of our understanding of innovation is based on high-income countries and the BRICS countries (i.e. Brazil, Russia, India, China and South Africa¹).

I address the shortcomings in the literature by exploring the use of a new analytical approach for analysing networked organisational forms through which STI capacity is developed and innovations are produced. Specifically, the role of an African university and its involvement in a development network organisation aimed at developing STI capacity in Mozambique is explored. I suggest the term, development network organisation (DNO), for referring to one of the new organisational forms emerging in the field of development recently. The emergence of these new networked organisational forms is mainly due to improvements in the understanding of knowledge generation and innovation as interactive processes, and the link between these processes and development (see Chataway et al, 2005).

This chapter is divided into three parts. The first section maps the origins of the present research study. The second section provides an overview of emerging trends in the development and innovation studies literature, highlighting the contribution of the present research to the literature. The third section outlines the main aims of the present research study and provides a detailed description of the case study analysed.

¹ Brazil, Russia, India and China together are commonly referred to as the BRIC countries, that is, a group claiming to represent the world's emerging economies. The group was formed to act as a counterweight to the groups representing the world's richest economies (i.e. G8 and G20) (The Economist, 29 March 2013). South Africa was added to the group in 2010 in order to include representation from the African continent (The Economist, 29 March 2013).

1.1 Origins of the present research study

The journey of the present research study began while I was an intern at a research institution in South Africa where I was involved in research on the developmental role of universities in several countries in sub-Saharan Africa: countries in the Southern African Development Community (SADC), Nigeria and Uganda. Drawing on a National System of Innovation framework, the focus was on the role of African universities in innovation, specifically the contribution of universities to economic development through interaction with firms. From this perspective, the processes of knowledge production and innovation were conceptualised as networked processes involving knowledge users and producers. The impetus for the focus on university-industry interaction was the understanding that 'the university', as one of the main knowledge producers in national systems of innovation, is a central actor in innovation. Furthermore, African universities, like their counterparts globally, are under pressure from national government and international development agencies to contribute to economic development more directly through collaborating with firms on ventures aimed at commercialising research outputs and aligning their priorities more closely with the needs of industry. With increasing neoliberal pressures, universities have also experienced a significant decrease in public funding recently, forcing them to engage in 'market' (e.g. patenting, university-industry interaction with a profit component) and 'market-like' (e.g. increasing revenue from students' fees) behaviours in order to sustain themselves (Slaughter and Leslie, 1997: 11).

1.1.1 Definition of innovation

An innovation is widely defined as a product (material goods and services) or process (way of producing goods and services) new to the organisation, country or market (Edquist, 2006). It can be technological or organizational, and involves either incremental or radical changes. Since the introduction of the concept, it has been adapted to incorporate new insights gained from empirical research in different contexts. For example, Bengt-Åke Lundvall's research on innovation in small resource-based countries in Europe showed that both incremental and radical changes produce higher economic value (Fagerberg, 2006). The concept was then adjusted to include incremental changes rather than declaring only artefacts new-to-the-world as innovations. The recognition that incremental changes too require adaptation and improvement also lead to an emphasis on learning. Accordingly, the definition of innovation widely used was broadened. The broad definition includes both the STI and Doing, Using and Interacting (DUI) modes of learning and innovation. The STI mode 'is based on the production

and use of codified scientific and technical knowledge' and is referred to as the narrow perspective, whereas the DUI mode is experienced-based (Jensen et al, 2007: 680). Learning and innovation developed in the STI mode takes place through formal activities (R&D) producing knowledge that is explicit and codified; whereas learning and innovation in the DUI mode takes place through interaction within and between organisations in the innovation system, sharing tacit knowledge and building competencies (Jensen et al, 2007). The broad definition of STI (including both STI and DUI modes) is most commonly utilised today and is used in the present research. It is also recognised that innovation is embedded in broader political, social, financial and cultural contexts.

1.1.2 Research on the developmental role of 'the university' in Africa

The main aim of the research was to map and describe the nature of university-industry interaction (with the aim of innovation) across countries at different levels of development in sub-Saharan Africa. Through the use of surveys and case studies, the research identified the types of firms and universities collaborating, the knowledge flows and the purposes of the collaboration. We found that university-industry interaction occurred on a relatively small scale across the countries but it was a growing trend (see HSRC, 2009; Kruss and Petersen, 2009; Kruss et al, 2012). This finding was expected. What was not expected was the extent to which the low-income countries and low-income regions within the middle-income countries differed from the higher-income contexts.

By the end of the research projects it became abundantly clear that universities in the low-income contexts did not fit the mould of universities in higher-income contexts (in middle- and high-income countries). The case studies, in particular, showed that the developmental role that these universities played seemed to be different. Firstly, the universities in the low-income contexts lacked academic capabilities (teaching, research, administrative and managerial capabilities) necessary for collaborating with industry. They also lacked physical and financial resources. Secondly, although the universities experienced pressures similar to that of universities in higher-income contexts, they also faced different context-related challenges. One challenge was the fact that local firms lacked capacity to innovate and engage in collaborative projects with universities. A third trend was interaction with multinational companies, farmers and farming co-operatives and farmers' associations. Another trend was reliance on foreign expertise and funding through linkages with foreign universities and international development agencies. Many of the collaborative projects were in some way

funded by international aid and tended to be 'donor-lead'. Informal social networks also played an important role (e.g. family ties, religious groups, etc.). An exploration of social hierarchies and cultural values and practices within the local communities was found to be essential for understanding how firms and other business entities emerged and operated. Furthermore, in a systematic review of the literature on innovation in low-income countries in Africa, we found that social organisations or community organisations (e.g. net committees involved in the distribution of malaria nets), individuals (e.g. shopkeepers trained to dispense malaria drugs) and households also played a significant role in innovation in these contexts (see Lorentzen, 2010). One conclusion of the research was that university-industry interaction occurred on a limited scale in the African countries and there were other stakeholders with which universities interacted in responding to needs of the local contexts, namely, community organisations, farming co-operatives, local government and other universities (domestic and foreign). Also, a better understanding of the role of local capacity, institutions and social networks was essential.

We found the innovation systems approaches useful but restricting and limited. The innovation systems approach was useful because it conceptualised knowledge production and innovation as a systemic and interactive process. The approach was restricting in that it held firms as central in the system whereas our research pointed to the centrality of other actors (e.g. farmers and universities). It should be noted that the innovation systems approach has been shown to be useful in the agricultural sector (rural innovation) (the work of Andy Hall is notable). It is not however easily applied across other sectors in low-income contexts (see Lorentzen, 2010, who suggests that development and innovation studies communities can learn from each other in developing more appropriate analytical tools). The innovation systems approach is limited in that it is 'under-tooled'. With this approach we could identify central actors and linkages, and describe channels of information and resource flows, but the approach lacked tools for analysing the role of tacit knowledge, specifically power relations and cultural values and practices. Other authors have also noted this shortcoming and have called for more appropriate tools for analysing the influence of tacit knowledge in shaping innovation initiatives (Bell, 2009; Johnson and Lundvall, 2003; Lorentzen, 2010; Lundvall et al, 2009; Oyelaran-Oyeyinka, 2006).

We were left with the question, what are the different collaborative arrangements universities utilise in their efforts to contribute to innovation in their local contexts? In attempting to take

the research further, we grappled with finding suitable analytical approaches and methods for analysing the organisational forms in which African universities were involved (e.g. government-university-MNC networks, industry-university-community networks, local university-foreign university networks, etc.) in contributing to innovation in their local contexts. What would be a suitable approach for analysing the networks through which African universities contribute to innovation? These questions informed the research questions of the present study.

The literature on development assistance and the impact of the rise in globalisation and advancements in information and communication technologies (ICTs) is discussed next. This is followed by a discussion on STI capacity-building in Africa and development more generally. Rather than presenting an exhaustive literature review, the section identifies trends and gaps in the literature. The second part of the chapter focuses on the case study analysed in the present research study, the MozOptom DNO. The organisational form through which the project was implemented and the socio-economic context of where it was implemented, Mozambique, are described.

1.2 The changing context of development

Prior to the 1970s, the international development community promoted technical assistance and the importing of knowledge and technology from high-income countries (Bell, 2009; Gaillard, 1994; Wilson, 2006). This approach emphasised economic growth and modernisation with the assumption that these automatically lead to improvements in the standard of living of citizens either directly or through a trickle-down effect (Gardner and Lewis, 1996). In development discourse, high-income Western countries were promoted as economic, social and cultural models for lower-income countries to emulate (Escobar, 1995). Lower-income countries were classified as 'underdeveloped' in relation to the 'models'. 'Old' approaches to development reflect a linear mode of knowledge production and innovation.

Today, economic growth and modernisation are still emphasised but it is widely acknowledged that economic growth does not necessarily lead to improvements in the standard of living of citizens in a linear fashion, and the trickle-down of benefits of economic development of some social groups does not occur in reality (Bell, 2009; Gardner and Lewis, 1996). This realisation has come about due to the overwhelming evidence that inequalities have widened even in high-income countries and especially in emerging economies reporting

high economic growth in recent years. Poverty has actually deepened in some low-income countries, mainly in Africa, despite targeted efforts through initiatives based on the Millennium Development Goals (MDGs) and large sums of aid (see UNDP, 2010). Reality is thus counter to what 'globalisation defenders or supporters' have claimed (e.g. Bhagwati, 2004; Wolf, 2004). Another reason for the transformations in development is that we now better understand the complexity of knowledge production and innovation, especially the interactive nature of these processes.

The definition of development that is now widely used in the international development community is that of Sen (1999) who described development as a participatory process (including citizens, government and other organisations) involving improvements in access to opportunities for citizens to live the lives they value (see UNDP, 2010). Sen (1999) referred to opportunities and capabilities as 'freedoms'. He did not however stipulate exactly which opportunities and capabilities are important in the current economy.

Development is, however, still a contentious field as it has been since the 1940s when President Truman of the United States identified the 'problem' of poverty in the 'Third World' (or the 'problem of the Third World') (see Escobar, 1995; Gardner and Lewis, 1996). Some authors have taken a radical approach in calling for 'alternatives to development' (e.g. Escobar, 1995) and an end to systematic aid (Moyo, 2009) while others have called for alternative definitions of development (e.g. Seers, 1979 in Nafziger, 2006; Sen, 1999), and alternative frameworks for designing and managing development assistance (e.g. Hall, 2002; MacLachlan et al, 2010).

Furthermore, the way in which aid is carried out and the legitimacy of aid has come into question recently (MacLachlan et al, 2010, provide a good overview; see also Mosse, 2005, and Moyo, 2009). One major reason for this is deepening poverty and the widening of inequalities in many low-income countries despite the large sums of aid provided in these contexts. Also, in the current economic climate, following a global recession, aid agencies are under pressure to show their relevancy and legitimacy in order to secure continued funding. In response to these issues, the international development community has sought to transform the way aid is done essentially by better co-ordinating their funding activities, promoting greater ownership on the part of 'aid recipients' and greater efforts at showing accountability

on the part of 'donors' (see The Paris Declaration on Aid Effectiveness 2005 and the Accra Agenda for Action 2008).

Bringing aid agencies under further scrutiny is the emerging literature, mainly new aid ethnographies, reporting a mismatch between aid policy and the implementation of aid projects on the ground, and unequal power relations. Furthermore, the need to investigate the gap between aid policy and how aid projects are carried out in practice and the relations 'between the people "doing" and the people "receiving" aid' (MacLachlan et al, 2010: 13) has been emphasised in recent years. Recently, aid ethnographies have showed that development is shaped by the ideas, values and everyday lives of the individuals implementing development projects, identifying a mismatch between aid policy and development in practice. The work of Mosse (2005) is most notable in this regard. Mosse (2005) among others (e.g. Eyben, 2009; MacLachlan et al, 2010) emphasise the need for aid agencies to take a more reflexive, learning approach to how they administer development assistance.

The increasing marketisation of aid has also been criticised, especially branding through the use of images of despair in advertisements to characterise low-income communities in Africa, and the market-like mechanisms, used by celebrities for example, in fund-raising campaigns (see for example, Richey and Ponte, 2011).

Another major transformation in the field of development is the change in the dominant players and the corresponding shifts in power. The rise of countries in Asia and Latin America (Asian Tigers and BRIC countries) has presented new, non-Western, models of economic and social development. Sachs (2007) refers to the current period of post-industrialisation as a period of 'convergence' characterised by North Atlantic countries losing their lead in the global economy and thus their hegemony. The hegemony that North Analytic countries developed during the first 150 years of the modern economy, a period of 'divergence', created a division between a global 'North' and 'South'. Other authors agree with this view that the core and periphery created during the previous mode of development is being undone (e.g. Bhagwati, 2004; Escobar, 1995). Bhagwati (2004, reprinted in 2007: 8), for example, refers to the current shifts in global power as 'an ironic reversal'. Some authors however disagree with the assertion that the current period is characterised by a state of convergence, noting that disparities between high-income and low-income countries are actually widening (e.g. Hart, 2002). Other authors have pointed out the unevenness of development within countries,

creating global networks mainly concentrated in global cities, contributing to a condition of widening inequalities within countries (see Ely and Scoones, 2009; Sassen, 2002b). The global division of labour is thus still skewed in favour of high-income regions (Kaplinsky and Masuma, 2009).

China and Brazil, in particular, have emerged as major players in development in Africa, using the provision of development assistance as a geopolitical strategy (Brautigam, 2009; Carmody, 2011). The increasing interest of China and other Asian and Latin American countries in providing development assistance in Africa has reduced the reliance of many African countries on development assistance from 'traditional' aid agencies. Kaplinsky and Masuma (2009) suggest that African countries (and other 'Southern' countries) now use their bargaining power to ensure that trade and development agreements with other countries work for them. Moreover, it is now widely recognised that western models of industrialisation have actually lead to increased environmental degradation, bringing into question the environmental sustainability of these models. Western models of development and modernisation are thus no longer promoted as suitable models for-lower income countries to emulate (Benkler, 2006; Conway and Waage, 2010).

In the case of Mozambique, Brazil is a major contributor, especially in agriculture and mineral resources (see Kaplinsky and Masuma, 2009). Much attention has been given to the role of China recently as it is becoming an influential player in development in Africa, and in Mozambique, through its growing contributions to the building of infrastructure in the form of aid and business partnerships. The relationship between China and Mozambique dates back to the colonial era when Chinese workers were brought into the country and later, when the Chinese government supported Frelimo in the fight for independence (Ilhéu, 2010; Roque, 2009). The two countries also share a socialist/communist background. China also has strong trade links with Brazil (Ilhéu, 2010).

Trade between China and Mozambique has increased. This trade is, however, skewed with China mainly importing resources from African countries and exporting, on a larger scale in comparison to imports, manufactured goods and labour to the African countries (Ilhéu, 2010; Roque, 2009). The difference in the roles played by China and Western countries (traditional 'donors'), is that China is more open to learning to find ways to best work with the local context and tends not to impose conditions (e.g. democratic governance) to the development

assistance they offer, whereas many Western countries do. Ilhéu (2010: 27) states that China's investment in Africa follows the principle of 'non-interference in African affairs' set-out in the Beijing Consensus, whereas Western countries follow the Washington Consensus of 'conditional aid to Africa'. This has, of course, been much criticised in the literature and so has the fact that China has been found to be guilty of neglecting human rights (mainly with regard to exploitative labour conditions) within its own national borders (Ilhéu, 2010).

China also invests in education in Mozambique in a more direct way than the 'Western model' of providing assistance through organisations, specialist agencies and consultants (see Njal, 2012). The Chinese model is demand-driven in that assistance is provided according to the needs communicated by Mozambicans rather than supply-driven, as with the Millennium Development Goals (MDGs). China has also provided scholarships and funding for Mozambicans to study at Chinese universities. The movement of students is, however, one-way.

According to Njal (2012), Mozambique and China also invest in the development of cultural links. For example, television and radio stations have formed partnerships for exchanging programmes. China's geopolitical strategy with regard to Africa thus goes beyond aid and trade.

The above discussion highlights the transformations in the field of development in recent years, influenced by improvements in the understanding of knowledge production (i.e. change from linear, Mode 1 mode, to the networked, Mode 2 mode) and the role of knowledge and innovation in development requiring a focus on developing indigenous capacity in lower-income contexts, as well as the rise in globalisation, ICTs and shifts in global power relations. These issues are discussed next, drawing on Castells' (1999, 2000a, 2000b) 'network society' theory.

1.3 Social and economic development in the current economy

This section mainly draws on Castells' (1999, 2000a, 2000b) theory of the 'network society' in describing the role of formal education and ICTs in social and economic development in the current economy, and the emergence of new forms of organisation in just about all sectors².

² Others have referred to the current economy as the 'networked information economy' (Benkler, 2006: 3), the 'connected age' (Watts, 2003) and most commonly, 'the knowledge economy'. It should be

Castells' (1999) explanation of the reasons for widening inequalities (between rich and poor, and the exploitation of minorities) and increasing social exclusion is a strength of the 'network society' theory (see van Dijk, 1999).

Castells (1999: 4) describes these processes in terms of a 'circle of social change' (presented graphically in Figure 1):

In a nutshell, cultural and educational development conditions technological development, which conditions economic development, which conditions social development, and this stimulates cultural and educational development once more. This can be a virtuous circle of development or a downward spiral of underdevelopment. And the direction of the process will not be decided by technology but by society, through its conflictive dynamics.

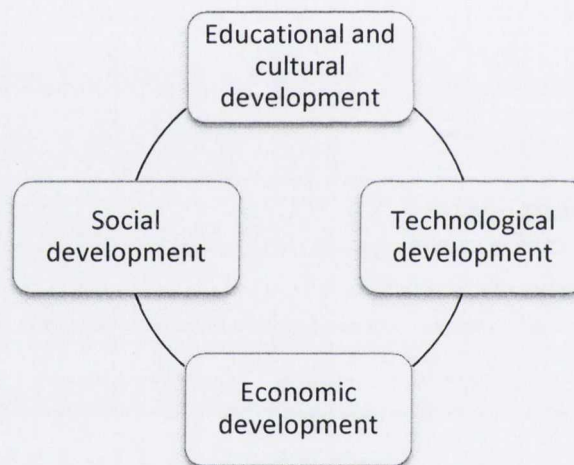


Figure 1 Castells' (1999) synergistic model integrating economic growth and enhancing quality of life

Note: The diagram was created by the author based on Castells' (1999) description of the model he proposes for understanding the 'circle' of social and economic change in the current paradigm.

noted that Castells' theory of the current economy is not completely new as it is similar to and draws on other influential theories (e.g. Tourain and Giddens). Castells brings together ideas in these theories to provide a theoretical understanding of the current economy. Although the theory is comprehensive, it has some shortcomings which some authors have identified (e.g. van Dijk, 1999). The shortcomings will be discussed later in this chapter. Castells' ideas on globalisation is also similar to that of other notable authors on globalisation including Bhagwati (2004), Hardt and Negri (2000) and Wolf (2004), especially with regard to the emphasis on the inter-connectedness of the global economy and the importance of global networks (e.g. multinational companies).

The model depicted in Figure 1 and explained in the quote from Castells (1999) proposes a way for the integration of economic growth and social development. There is overwhelming evidence that the emphasis on economic growth for development has not been as effective in reducing poverty as initially hoped and low-income countries in sub-Saharan Africa have actually reported deeper levels of poverty (see for example, UNDP, 2010). In the case of Mozambique, for example, conditions have improved among the wealthier social groups with those in the middle not showing much change and those below the national poverty line slipping further down (World Bank, 2008; Hanlon, 2007). This indicates that the prospects of economic globalisation have not been as advantageous for development as some globalisation theorists predicted (e.g. Bhagwati, 2004). Global-scale solutions like trade liberalisations put forward by Bhagwati (2004), for example, have not solved the problem of widening income inequalities and social exclusion. The strategy of developing adequate indigenous capacity for participating in the global economy as consumers or producers, as Castells (1999) suggests, seems more promising. Individuals require the necessary capabilities to access opportunities presented by globalisation either directly or indirectly (i.e. through social relations with those who can access important services directly) (see Castells, 1999, 2000a, 2000b; Hanlon, 2007; Sen, 1999). In this regard, adequate skills and physical infrastructure are essential. Sassen (2002a) emphasises the necessity of physical infrastructure and social networks (of adequately skilled individuals) for managing virtual flows of resources and electronic transactions.

A different strategy is, however, required for addressing poverty among the 'very poor', that is, social groups well-below the national poverty line who struggle to even feed themselves and their families. An effective social welfare system is necessary to provide these social groups with the means to participate in the economy as consumers (Bardhan et al, 2006; Hanlon, 2009).

The role of technology, specifically ICTs, in development is discussed next. This is followed by a discussion on the role of education.

1.3.1 Technology and development

The role of knowledge – and thus STI – in economic and social development is not new and neither is the role of networks. These processes gained importance as we developed greater insight into the complexity of knowledge generation and innovation, and the link between these two processes and development (Fagerberg, 2006; Johnson and Andersen, 2012).

According to Castells (1999, 2000a, 2000b), what is new in the current economy is the level of interconnectedness and interdependence among capital markets worldwide, supported by ICTs. Here, a global economy is defined as 'an economy whose core activities work as a unit in real time on a planetary scale' (Castells, 1999: 4). This became clear during the 2008 global financial crisis. What is also new is that the current economy is tooled by rapid advancement in ICTs. In the global economy, the 'business project' or network is the unit of production and not the firm, although the firm would continue to be the legal unit.

ICTs and globalisation act as double-edged swords creating the current situation of widening inequalities and social exclusion. The global economy, from a network perspective, is organised around the network logic of inclusion and exclusion. The global economy shows the simultaneous capacity to include and exclude individuals, territories and activities based on their usefulness (Castells, 1999). ICTs and globalisation provide opportunities for individuals to improve their livelihoods but at the same time, disadvantage individuals unable or unwilling to access and use ICTs in order to take up opportunities presented by linking into global networks. Adequate ICT infrastructure is thus essential for development³.

Low-income African countries have a double disadvantage in the current economy as they are characterised by inadequate basic infrastructure (e.g. roads, sanitation, levels of literacy and numeracy, etc.) and information-processing capacity (i.e. a skilled labour force, culture of using science and technology and innovating, open attitude to learning, and physical infrastructure) (The UN Millennium Project, 2005: 148). As a result, low-income African countries tend to be marginalised from the global economy with some regions within these countries left out due to their lack of ability to process complex information and link into networks through which they can access useful resources. Growth in ICTs, especially mobile telephony, has been remarkable in these countries. This has allowed them to leap frog stages of development to an extent (ITU, 2011). According to the International Telecommunication Union (ITU, 2011), the least developed countries in the world (which includes Mozambique and other low-income countries in Africa) have shown progress in the diffusion of ICTs, but blockages remain. Blockages include the lack of affordability of ICTs and the emphasis on adopting technologies from technologically-advanced countries that may not be suitable for the context. Furthermore, economic growth and improvements in living conditions within

³ It is important to recognise, as Castells' (1999: 3) and others point out (e.g. Bijker et al, 1987; Latour, 2005), while '(t)echnology per se does not solve social problems', technology (especially ICTs) provide tools necessary for economic and social progress in the global society we live in today.

these countries were found to be uneven with improvements mainly found in urban areas and major cities (see UNDP, 2010). In general, low-income countries in sub-Saharan Africa play a marginal role in the global economy, mainly as suppliers of primary commodities and low-value-added products (UNCTAD, 2013; World Economic Situation and Prospects 2013).

The growing importance of global networks mainly located in major cities is indicated by the significant role that multinational corporations and high technology regions like Silicon Valley play in economic growth on a global scale, and the movement of highly skilled individuals from all over the world to regions like Silicon Valley. Lower-income contexts thus lose large numbers of skilled individuals and individuals with potential to higher-income contexts, contributing to production mainly in those contexts. This has created a condition of unequal division of labour on a global scale in favour of higher-income contexts (see Kaplinsky and Masuma, 2009). Regions (i.e. geographical areas within countries or continents) successful in providing adequate opportunity for developing the necessary capabilities also lose important human resources required for competing in the global economy. According to Castells (1999), it may be more important for regions to concentrate on finding ways to attract highly-skilled individuals, increasing their status in global networks. In other words, both participation and position in the network society is important.

Access to information-embedded resources is, however, very uneven and international trade regulations tend to disadvantage certain regions, with low-income countries in Africa, in particular, being marginalised (Castells, 1999, 2000a; Benkler, 2006). Those who are left behind or are left out altogether do not have bargaining power as producers or consumers to negotiate with powerful corporations and other global networks to ensure that their needs are met (e.g. convincing pharmaceutical companies to give more attention to developing vaccines and drugs for diseases most common in lower-income contexts) (see Benkler, 2006). They could try to form their own networks and gain access to other useful networks, but adequate capabilities to do so is a prerequisite. Castells (1999) states that the logic of inclusion and exclusion has resulted in the social crises we now face: social exclusion and inequalities on an unprecedented scale. He refers to this as the creation of the 'Fourth World'. The 'fourth world' includes individuals, in all countries, who society has faded out or left out due to their lack of contribution to the network society, including poverty-stricken social groups (e.g. homeless individuals), drug-addicts, criminals, etc. In Saskia Sassen's (TCD/UCD

Lecture, 15 January 2013) words, large numbers of people have been 'expelled' from the global society to 'the Fifth Circle of Hell'.

Formal education plays an important role for developing the necessary capabilities for participating in the global economy. In sub-Saharan Africa, research has shown a link between internet use and formal education (see Oyelaran-Oyeyinka, 2006).

1.3.2 The role of formal education

The formal education sector is one of the key features in the network society. The premise that formal education is important in the network society is based on the fact that those who fare well in the network society are those with the skills to process complex information and produce knowledge. The majority of people would, however, at best be consumers of knowledge and other products of the network society (Castells, 1999).

National education systems, from primary school to university, play an important role in the development of essential skills for participating in and advancing the network society. Fundamental skills important in the network society include basic literacy (the ability to read and write), numeracy, lateral thinking and problem-solving skills, proficiency in the use of computers and the Internet, and the ability to seek out and assimilate relevant information and knowledge (basic research skills). Also important is social skill, which refers to skills related to the ability to work in a team, facilitate co-operation and link into useful social networks (see Fligstein and McAdam, 2012). Higher skills required, mainly offered by the higher education sector, include what Bell (2007, 2009) refers to as innovation capabilities: management, research and development (R&D), design/engineering and entrepreneurial capabilities.

Castells (1999) indicates that a high level of enrolment in the formal sector is not enough, the quality of the education received is important. Many countries in low-income and higher-income contexts (e.g. many countries in Africa, certain regions in the United States) are not providing citizens with quality education and thus not adequately preparing them for participation in the network society (Castells, 1999). Following the MDGs, low-income countries in Africa, including Mozambique, have made major strides in expanding participation at all levels of education, mainly at primary school level. They have not, however, made much progress in ensuring that the education students receive is of acceptable quality

(www.unicef.org/mozambique/education_2935.html, accessed 24 April 2013). Also, relatively high illiteracy rates continue to be a problem. These regions thus tend to report high levels of unemployment.

Besides contributing to the production of a skilled labour force, education systems also play a key role in cultivating cultural norms and practices conducive for participation in the network society. Education institutions redefine what is valued in society and meanings assigned to activities and experiences, aligning cultural development with development goals in the network society (Castells, 2000a). Social and economic development depends on innovation (for profit and not-for-profit) and requires a culture of trust, information sharing, use of ICTs, entrepreneurialism, and learning through doing, using and interacting (Castells, 1999, 2000a; Johnson and Andersen, 2012; Lorentzen, 2010). The importance of cultivating a culture of innovation and using science and technology in low-income countries in Africa has been emphasised (see ATPS, 2010). For example, the socialisation of STI is included in Mozambique's STI policy (MOSTIS, 2006).

Meyer et al (2007) indicate that while much attention has been given to the organisational transformations of universities in the literature, 'the university' is best perceived as a 'global institution'⁴. From this perspective, we can understand that what has sustained 'the university' as an institution for centuries is essentially its role in cultural production and reproduction.

1.3.3 The role of national governments

The role of national governments has been redefined to some extent. Although the network society is characterised by globalisation, it does not mean that the nation state has been eliminated or has become obsolete (Castells, 1999; see also Hardt and Negri, 2000). National governments have adapted their roles for the needs of the current economy. One significant adaptation is the role of national governments in facilitating global networking and regulating global flows of information and other resources. Hardt and Negri (2000) indicate that the idea of some countries being 'underdeveloped' and others 'developed' does not make sense in the current economy as the economy is structured around global flows of resources that all need to link into or risk being marginalised or left out. National governments have begun to share

⁴ In this thesis, universities have been referred to as organisations when discussing them as formally constituted organisational structures but have been analysed as institutions.

sovereignty through involvement in supranational bodies (e.g. International Monetary Fund, the European Union, NEPAD, etc.). Governance is increasingly decentralised.

National governments are also expected to play a role in cultivating trust in society through making basic services (e.g. education and health care) accessible to all citizens, and implementing suitable policy for bringing about the lifestyles and livelihoods valued in the nation state. They are expected to work through participatory processes (including citizens, government and other organisations) in improving access to opportunities and the development of capabilities for citizens to live the lives they value, that is, providing citizens with the 'freedoms' to pursue the lives they value – following Sen's (1999) definition of development that is now widely utilised in development (see for example, UNDP, 2010). Bardhan et al (2006), drawing on the experience of European welfare states, suggest that governments need to implement social welfare or insurance strategies in order to uplift poor communities. They state that implementing such strategies is, however, difficult in the current, global economy. Similar to Bardhan et al (2006), Hanlon (2009) suggests that the government of Mozambique has to learn from other 'developing countries', like Brazil and South Africa, that managed to reduce poverty by implementing effective social welfare strategies. Hanlon (2009) suggests that the only way that the Mozambican government can assist 'the very poor' in the country to improve their living conditions is through providing them with a type of social grant that they can use to feed themselves and their families, and access essential services (i.e. health and education).

1.3.4 Problem of embeddedness

Castells' (1999, 2000a, 2000b) 'network society' theory does have one major flaw: the role of cultural values and practices and human agency is underrepresented. These context-related factors were highlighted earlier in the discussion on trends in the development and innovation studies literature. Van Dijk (1999), in a review of Castells' trilogy of work presenting his theory of the network society, concludes that, overall, the theory tends to be one dimensional and socially and technologically deterministic. For example, the theory posits that once codes guiding interaction within networks are established, any transformations to the networks occur from the outside, thus neglecting the role of human agency. The core of the theory is network morphology, which allows for interesting insights, but this should be complemented with an emphasis on the embeddedness of social interaction. Van Dijk (1999) also indicates

that Castells' theory does not recognise the increasing power of social movements for bringing about change in society.

Castells' network society indicates how countries (and individuals) can use the opportunities presented by the rise in globalisation and ICTs to their advantage. Participating in global networks to access and generate knowledge and other useful resources, producing a skilled labour force and attracting talented individuals are identified as key components of development in the current economy. The formal education sector (the higher education sector in particular) and efficient ICT infrastructure are the foundations of this strategy. Development strategies do, however, need to be grounded in the political and socio-economic realities of the context. As indicated above, Mozambique, like other low-income countries in Africa, presents complex challenges with regard to development. In the next section, science, technology and innovation (STI), in the context of low-income countries in Africa, is discussed.

1.4 Developing STI capacity in low-income countries in Africa

There is general agreement that Western models of development are no longer appropriate for low-income countries to emulate due to the realisation that these models are not environmentally sustainable and evidence of the effectiveness of development strategies utilised by emerging economies (e.g. the Asian Tigers) (Conway and Waage, 2010; Stirling, 2009). Emphasis is thus being placed on the need for low-income countries to develop more appropriate development strategies suitable for their contexts. New strategies that are emerging are discussed next.

1.4.1 New STI-related development strategies

Science, technology and innovation (STI) has been on and off the agenda of international development agencies since the 1940s, and it is now once again being promoted (Chataway et al, 2005; Leach and Scoones, 2006). The role of indigenous capacity for STI in social and economic development has been increasingly emphasised in recent years (see for example, UNDP, 2010). Castells (1999) indicates that low-income regions in Africa are increasingly marginalised in the global economy, and thus continue to be poverty-stricken, because these regions lack adequate information-processing tools (mainly skilled human resources and ICT infrastructure) for participating in the global networks around which the current economy is organised. Low-income countries in Africa have begun to integrate STI into their national policies. Mozambique, for example, has included the development of STI in its PRSP,

highlighting the need to develop science and technology development centres (e.g. sciences parks) and science and technology incubators, and grassroots innovation (see IMF, 2011). The development of STI capacity for improving the development of new products, services and process, especially in agriculture, is promoted. The importance of the development of STI capacity for poverty reduction in Mozambique is elaborated further in the Mozambique Science, Technology and Innovation (MOSTIS, 2006).

Researchers highlighting the importance of innovation for development have begun to raise questions about the kinds of innovations needed for development. Leach and Scoones (2006: 12-13), for example, suggest the 'slow race' approach to development as a complement to the other two 'races': 'the race to the top of the global economy' that emphasises the role of science and technology for economic development with the aim of a trickle-down effect; and 'the race to the universal fix' that focuses on promoting "breakthroughs in science and technology" for poverty reduction. The latter approach involves the formation of centres of excellence that run the risk of becoming elite institutions if interaction and knowledge exchange are not encouraged. These approaches are thus not useful for achieving inclusive development, whereas the 'slow race' emphasises the need to mainstream science and technology in development policies (national, regional and international) and for this to be a participatory approach that engages ordinary citizens. Like the innovation systems approach, innovations are seen as embedded in the economic, social, political and cultural institutions of the context. What is most useful about the 'slow race' approach is that it "...raises questions about the ways problems and solutions are being defined, suggesting limitations and trade-offs in making technology work for the poor" (Leach and Scoones 2006, p. 18).

Asking similar questions about the framing of innovation are approaches to innovation for sustainable development, which are gaining momentum with the growing importance of issues around environmental sustainability and the recognition that countries have to develop more sustainable trajectories for development. For example, the '3D Agenda' forming part of the framework of the STEPS manifesto not only takes into account the importance of the institutional context and a specific focus on reducing inequalities, but also indicates the need to question how development solutions and problems are defined (see Stirling [2009] for a detailed description of the 3D Agenda). The 3D Agenda goes further in pointing out plurality in approaches to innovation and paths for development, including approaches and paths that go

beyond the narrow aim of economic development that has been shown to be ineffective in achieving broad based and inclusive development.

These questions are crucial for achieving inclusive innovation systems but are not usually addressed by innovation systems approaches.

The development of innovations (products and services) within low-income countries, by local firms and for the local market, is also increasingly being promoted (Clark et al, 2009). The impetus for this focus is the recognition of the need to develop local demand for products and services, creating a community of consumers, which Castells (1999) (among others) indicates is important for increasing social inclusion. This is indicated by the increasing popularity of terms such as Mohamed Yunus's 'bottom-of-the-pyramid' schemes, 'grassroots innovation' and 'below the radar innovation'. Clark et al (2009: 18-20) indicate that such innovations are not really profitable for multinational corporations and do not contribute much to the global economy, but they do serve as a strategy for (national) long-term economic development.

Similarly, social innovation is being increasingly promoted as a strategy for development in low-income contexts (in higher- and lower-income countries) (see for example, Goldsmith, 2010). A social innovation is defined as '(a) novel solution to a social problem that is more effective, efficient, sustainable, or just than existing solutions' in the context 'and for which the value created accrues primarily to society as a whole rather than private individuals' (Phills et al, 2008: 1). Although social innovations play significant roles in social change and development, little attention has been given to this type of innovation and the role of the not-for-profit sector in the innovation studies literature, which dominates understanding with regard to innovation (Christensen et al, 2006).

Some authors suggest that low-income countries in Africa take a more strategic approach to utilising tools and opportunities available in the 'network society' (Castells, 1999) by investing in the development of regional centres of excellence. This strategy is suggested for attracting and thus retaining local expertise (see Castells, 1999). Chataway et al (2005) provide an example of how regional centres are able to access knowledge and technology not available in the local context through linkages with other centres globally, including leading global centres. Leach and Scoones (2006) indicate that the strategy of investing in regional centres of excellence is important for developing STI capacity, but should be balanced with strategies

focussed on grassroots or bottom-up development in order to ensure that already marginalised social groups are not further marginalised (i.e. the 'slow race' strategy).

1.4.2 Analytical approaches

With regard to the strategies promoting the focus on the contribution of innovation for development, the perspective of economists, and hence the emphasis on commercial value, tends to dominate. A dominant approach in the mainstream innovation studies literature is the innovation systems approach (i.e. national, regional and sectoral innovation systems approaches). What makes innovation systems approaches appealing for achieving development goals is the utility of these approaches for assessing system failures and as a heuristic tool for developing the building blocks for innovation – specifically, the focus on competence building, the central role of institutions (national, regional and international), the promotion of interaction between institutions, and the role of the state in creating a policy environment conducive to innovation (Johnson and Lundvall, 2003; Muchie, 2003). Innovation systems approaches have, however, been criticised for being too deterministic even as a heuristic tool (see Pinch and Bijker, 1987) and not paying adequate attention to informal institutions in empirical research (see for example, Schoser, 1999). Researchers promoting innovation systems approaches have also indicated that current innovation systems approaches are not useful for analysing power dynamics and social inequalities, and thus for achieving inclusive development (e.g. Johnson and Lundvall, 2003; Muchie et al, 2003). My colleagues and I came to a similar conclusion in our research on the developmental role of universities in sub-Saharan Africa (as discussed earlier). 'New' approaches and meanings are, however, emerging.

Following from this, alternative approaches to analysing innovation, that is, approaches other than innovation systems approaches, are becoming popular. The increasing recognition of the role of social relations and importance of learning in innovation and development have led to a growing interest in the dynamics of relations, network building, social learning and negotiation within social networks. The use of Nelson and Sampat's (2001) framework highlighting the importance of social technologies in innovation is one example. The concept, 'social technology', is defined as 'the way work is divided and coordinated' (Nelson, 2008: 3). One example of a social technology is the International AIDS Vaccine Initiative (IAVI), which is a not-for-profit organisation that describes itself as a 'virtual pharmaceutical company' (Chataway et al, 2010: 1283). Another example is 'the business school', which is a social

technology that emerged due to the need for a mechanism for training professional managers (Nelson, 2008: 5). The concept was introduced by Nelson and Sampat (2001), in the context of economic activities, for describing the co-evolution of social technologies, physical technologies and the institutional environments in which they are embedded. Chataway et al (2010) apply the concept of 'social technology' to the analysis of mechanisms (specifically development networks) through which health innovations are produced in resource-poor contexts in Africa. They were the first to apply the approach to the analysis of case studies in the field of development.

The advantage of this approach is that it takes a systemic perspective to the analysis of innovation activities and it focuses on the development network as the unit of analysis. It is not, however, adequate for addressing the gap in understanding about how individuals through their social relations within development network organisations (DNOs) and actors in the local context, shape development. Hence, issues with regard to unequal relations and agenda-setting (i.e. power) are not addressed.

Innovation researchers highlighting the need for more inclusive and sustainable approaches to development have raised questions about whose needs are being met by STI development initiatives and whose solutions are put forward (e.g. Leach and Scoones, 2006; Marjanovic et al, 2012; Stirling, 2009). Approaches conceptualising STI 'products' as social constructions are most suitable for addressing these questions.

Social constructionist approaches by researchers in the field of the sociology of science and technology take these questions into account and provide useful tools for analysing innovation. Notable approaches include that of Pinch and Bijker (1987), Callon (1987) and Latour (2005). Pinch and Bijker (1987) emphasise the role of different social groups (i.e. groups of producers and users) in co-producing scientific findings and knowledge. Actor-network theorists (Callon, 1987; Latour, 2005) emphasise that 'the social' is produced through interactions between actors (human and non-human, for example, physical technologies) in networks.

Other social constructionist approaches, including actor-oriented approaches, are also becoming popular in the fields of innovation and development (Briggs and Matsuert, 2004; Long, 2001). Long's (2001) influential actor-oriented (social constructionist) approach in the

sociology of development, for example, emphasises the role of human agency in shaping development outcomes. Long (2001) indicates that the outcomes of development projects are shaped by the ideas, values and practices of the individuals involved in these projects. He shows that actors involved in development projects tend to find ways to ensure that the project benefits them, regardless of their status in the project network. Hence, in recognising the role of human agency, it becomes apparent that in development projects, power is not simply along the lines of 'donor-recipient' unequal relations.

Also, development projects tend to have unintended benefits. Ferguson and Lohman (1994) highlighted this in their research on Lesotho. They indicate that development projects are often not pro-poor as these projects are not designed to meet the needs of poor people, and thus they do not show much impact in reducing poverty, which is what they claim to do. Hanlon (2009) shows how development projects in Mozambique mainly benefit those who are able to participate in the projects, thus excluding those who are very poor (i.e. those who cannot).

Participatory and communication frameworks are becoming popular especially in the field of agriculture and extension, drawing on Rogers' (2003) work on the diffusion of innovation which emphasises that innovation is a process in which communication networks play a key role (Clark, 2010). Leeuwis (2004), who advocates the use of communication and communicative interventions in the field of extension, suggests that network building, social learning and negotiation in social networks are key components of innovation. Leeuwis (2004), among others (e.g. Clark, 2010), thus suggest a network perspective for analysing innovation. Leeuwis (2004: 375) suggests that the concept 'network' is more apt than 'system' in recognising the blurring of boundaries between actors in multi-actor situations, the embeddedness of actors in social networks and wider institutional contexts that impact on the process of innovation, and moves away from 'pre-assumed common purpose'.

Researchers in the field of innovation studies have also utilised social network analysis (SNA) as a research method. Coulon (2005), who conducted a review of the use of SNA in innovation research, indicates an increase in the use of SNA by innovation researchers in recent years. Coulon (2005) found that the main nodes (actors) analysed are organisations and publications (mainly patents), and the main methods of analysis are statistical methods with most of the research being conducted on the biotechnology and semi-conductors industries. While

statistical methods are useful for analysing complex networks, these methods are limited and do not allow the analysis of the process components, which cannot be adequately understood from the aggregates of individual behaviour produced by statistical analysis (Coulon, 2005). Furthermore, in the innovation literature there tends to be a focus on directed ties, which is understandable considering the importance placed on knowledge flows (Coulon, 2005; see also Chataway et al, 2005). However, the fact that most of the empirical literature reviewed by Coulon (2005) analysed unweighted ties indicates that the strength of ties have not been given adequate attention. Of course, this may depend on the specific nature of the networks studied.

Some authors, who have investigated the gap between the rhetoric of 'partnership' in development and development practice, also suggest the adoption of a network approach (e.g. Bebbington and Kothari, 2006). There is overwhelming evidence that although partnerships and networks are now buzzwords in development practice, many of the current forms of development partnerships or networks involving individuals or organizations in lower-income countries and more advanced countries are not achieving the desired outcomes of improving people's quality of life (see for example, Hall, 2002; Junghanss, 2005; MacLachlan et al., 2010). A shortcoming of the empirical literature, including research employing SNA, is the lack of attention giving to the direct interaction and influence of aid agencies in development networks (e.g. Clark, 2010).

What the above discussion indicates is that development is rooted within networks, as Bebbington and Kothari (2006) show. A problem in the field of development is that development agencies tend to place greater emphasis on the development of physical infrastructure without much attention to the role of development networks (Chataway et al, 2005). Also highlighted in the literature is the lack of consideration for existing local capacity, local networks and local institutions in development practice, indicating that the emphasis placed on drawing on local capacity in policy has been slow to translate into practice (see for example, Chataway et al, 2005; MacLachlan et al, 2010).

1.4.3 The 'development network organisation' (DNO) as a mechanism for accelerating STI-capacity development

Chataway et al (2005, 2010), among others (e.g. Marjanovic et al, 2012), have indicated a gap in understanding with regard to the 'agency' through which innovations in low-income or

resource-poor contexts are produced, specifically what works and what does not work in STI capacity-building in these contexts. This gap in understanding points to the need for research on the actual mechanism, that is, the 'social technology' through which innovations are produced.

Recently, the potential role that development networks, including a mix of local and international or foreign organisations, can play in accelerating the development of STI capacity has been highlighted (see Chataway et al, 2005, 2010; Leach and Scoones, 2006; Marjanovic et al, 2012). Also highlighted is the emergence of new networked organisational forms emerging in the field of development, which are characterised by collaboration among a group of organisations aimed at achieving specific development goals (e.g. producing an AIDS vaccine) (see Chataway et al, 2005). I refer to these formally constituted inter-organisational networks as 'development network organisations' (DNOs).

DNOs are flexible, temporary organisational structures consisting of a group of autonomous organisations working together to achieve common development goals (based on the definitions of network organisations provided by Borgatti, 2001, and Holohan, 2005). I argue that DNOs are different from other forms of organisation (e.g. consortium) as they tend to be organised around the production of a 'development product', are thus 'mission driven' (Chataway et al, 2010: 1286), and emphasise collaboration among all actors involved in the network. They are thus also temporary organisational forms as there would be no need for the organisation to continue to exist once the common goals have been achieved, unless new common goals are identified. Like other new networked organisational forms that have become ubiquitous in the current economy, DNOs are tooled by ICTs. Development assistance has always been characterised by inter-organisational interaction, what is different now is the realisation of the inter-dependency of organisations as a result of a shift in thinking in development practice and the level of inter-connectedness made possible by ICTs.

1.5 Conclusion

The analysis in the present research is based on the premise that development is rooted in social networks extending across space and time (Bebbington and Kothari, 2006: 849). Development is increasingly understood as a 'networked' endeavour. New organisational forms that are emerging in the field of development present mechanisms through which the development of STI capacity can be accelerated. The opportunities that global networks

present in the current economy are influenced by the changing context of development, especially changes in global power relations and advancements in ICTs. The literature review highlighted two conceptions of development networks: 1) pipes or channels through which information or other resources flow, making resources previously not easily accessible, accessible, and 2) as mechanisms through which development is shaped by the thoughts, values and actions of project members through social interaction. The 'products' of development projects are thus social constructions, produced in social interaction governed by institutions that are produced and reproduced through social interaction.

The discussion identifies the need for research on development networks as the social technologies utilised for 'producing' development, specifically how interaction within the networks and between the networks and the broader institutional contexts into which they are embedded, shape development. It is this gap in knowledge that the present research study aims to address. I propose a network-institutional approach, which brings together analytical tools provided by social network analysis and institutional (especially, neo-institutionalist) theories, to address the gap in understanding. The network-institutional approach is useful because it allows for systemic analysis and analysis at the meso and micro levels. Since the approach is applied to the analysis of a case study, the research also provides an empirical understanding of the development of STI capacity through DNOs.

1.6 The present research study

The main aim of the present research is to explore the role of a development network organisation (the MozOptom DNO) in developing optometry-related STI capacity in the Northern region of Mozambique. The development network organisation (DNO) consists of an African university in Mozambique, two European universities and an African NGO. It is funded under a larger aid programme. Since the optometry profession did not exist in Mozambique prior to this initiative, it presents an interesting case of how an African university, in collaboration with a group of external actors, develops STI capacity in the local context.

The DNO is described next, followed by a description of the socio-economic context in Mozambique, that is, the context in which the DNO is embedded.

1.7 Developing capacity for STI in the field of eye-care

1.7.1 The DevAid Programme of Collaboration (PCHE)⁵

The MozOptom project, which was awarded 1.49 million euros funding, was funded under Round 2 of the DevAid Programme of Collaboration (PCHE). DevAid is the official overseas development agency of the Northern European country involved in the MozOptom project (hereinafter referred to as NEuro). The PCHE was designed specifically to develop collaborative partnerships between universities (and other higher education institutions) as an instrument for development. The PCHE promotes teaching and research collaboration between universities in NEuro and the developing countries where DevAid works. The projects would thus support DevAid in achieving its goal of accelerating its priority countries' progress towards achieving the Millennium Development Goals (MDGs). This is also the first initiative promoting strategic links within and between universities in NEuro for supporting development. In recognising the need to develop the capacity of NEuro universities to collaborate in the area of development, in some cases, the programme provided networking grants for NEuro universities to firstly establish linkages among themselves and universities in developing countries before providing full funding for collaborative projects. It is thus an interesting case for the purposes of the research. The PCHE was launched in 2006 and has had three rounds of funding since then, totalling 16 million euros (funding 15 initiatives).

Figure 2 includes the first two Rounds of funding. DevAid is administering the programme with the assistance of the national Higher Education Authority (HEA). Essentially, the HEA administers the programme on DevAid's behalf. The funding model requires that each project select a lead institution and key contacts at the lead institution with whom the HEA communicates. Only NEuro higher education institutions can be selected as lead institutions. The funding is distributed to the project via the lead institution, which contributes about 30 per cent of the funding. In the case of NEuroIT, it has contributed overheads and waived fees for the PhD students funded as part of the project. In Figure 2, the dotted lines between

⁵ In order to protect the confidentiality of the participants in the research, the names of the organisations involved in the development network and the places in which they are located has been changed. The names of the development project and larger aid programme have also been changed. The names of the organisations and the city in Mozambique in which the training programme was established are fictional. I borrowed the name, Tizangara, from Mia Couto's book, 'The last flight of the flamingo' (2004, the version translated by David Brookshaw). Tizangara is a fictional town. Cultural values and practices in the town, especially the emphasis that the inhabitants of Tizangara placed on superstitions and storytelling, the interactions with 'white people' and the humour of the inhabitants of the town resemble that of the actual city in Northern Mozambique where the research was conducted.

DevAid and the lead institutions indicate that although all formal lines of reportage are channelled via the HEA, it was common for key contacts of the projects to also contact DevAid directly. Since the development community in NEuro is relatively small, and it is a small country, key actors involved in the programme tend to interact fairly often and the culture of business tends to be relatively informal.

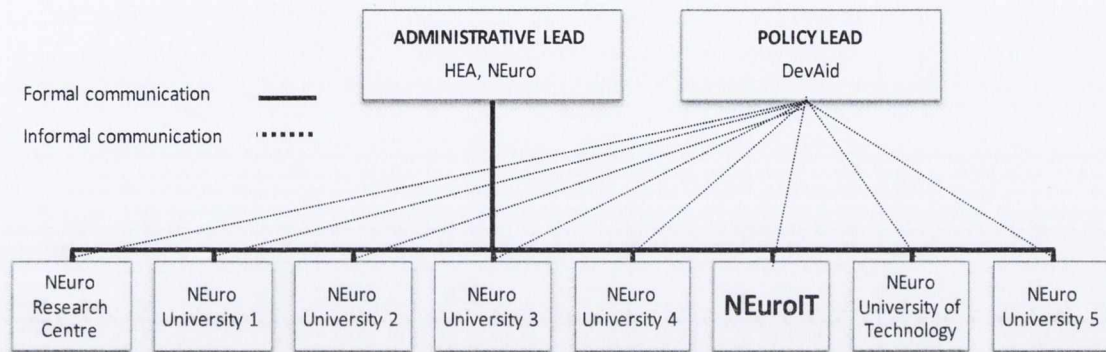


Figure 2 Organogram of the PCHE

Notes:

1. The organogram was developed in collaboration with the key contacts within the PCHE (including those at the funding agencies and projects) during the first stage of the research.
2. The dotted lines represent lines of communication that are not part of the formal lines of reportage.

1.7.2 The MozOptom development network organisation (DNO)

The MozOptom project is a five-year project (2009 to 2013). It was initiated to address inadequacies in the eye-care system in Mozambique. The project is being implemented by a development network organisation (DNO), including an African university in Northern Mozambique (UniUS), an international NGO based in Southern Africa (OptomNGO), a Northern European Institute of Technology (NEuroIT) and a Northern European university (NEuroUni). The School of Optometry was established in the Faculty of Health Sciences at the University of Science, Northern Mozambique (UniUS), which is located on the fringe of one of the largest cities in Mozambique (Tizangara City). Tizangara City is located in one of the most populous and poorest regions of the country. Paradoxically, the region is often referred to as the breadbasket of Mozambique because a large proportion of crops (e.g. maize, beans,

groundnuts, cotton, cashews, etc.) produced in the country is produced in and exported from the region (de Vletter, 2004).

The ties between the DNO and the main funding agencies are depicted in Figure 3. It can be seen that the hierarchical structure stipulated by the funding agencies operates alongside the (inter-dependent) network relations within the DNO. Since NEuroIT is the lead institution, it is expected to co-ordinate activities of the DNO and is held accountable for the project.

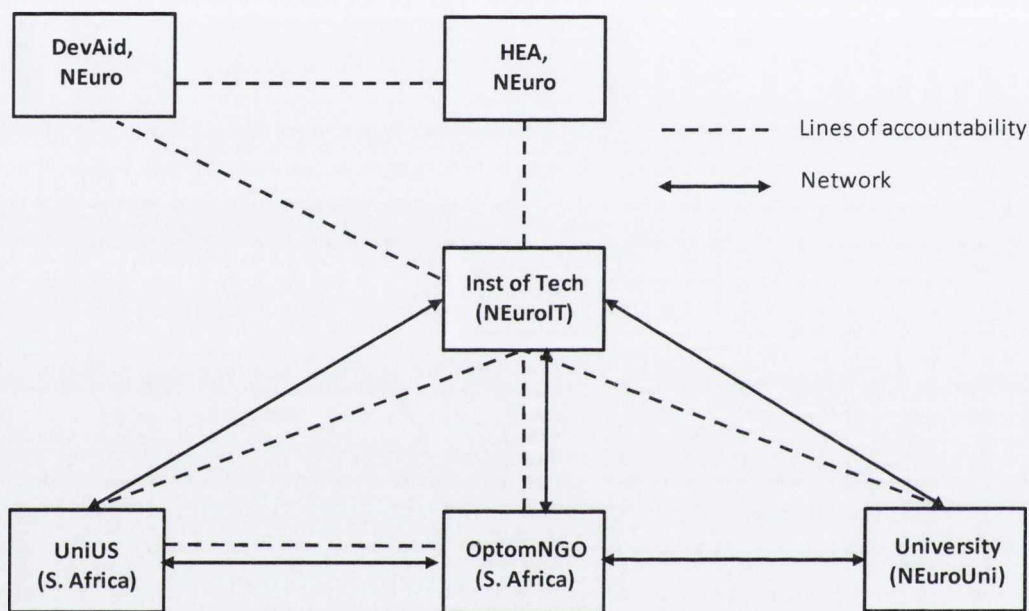


Figure 3 The MozOptom project, lines of accountability and network relations

With the aim of developing optometry capacity in Mozambique, the strategy of the project includes the development of a training programme and vision-care centres providing optometry services, at no cost or for a nominal fee, to financially disadvantaged individuals. Since Lusophone countries in Africa lack optometry capacity, it is envisioned that the optometry school established by the project would become a regional training centre for Lusophone countries in the region.

The different components of the project are illustrated in Figure 4 below. It can be seen in Figure 4 that the project also includes a research component. The research is conducted mainly by PhD students whose studies are funded as part of the project. The undergraduate optometry students at UniUS are sometimes involved in the research as research assistants. During the period in which the research was conducted, the project activities centred mainly on the development of the optometry school at UniUS.

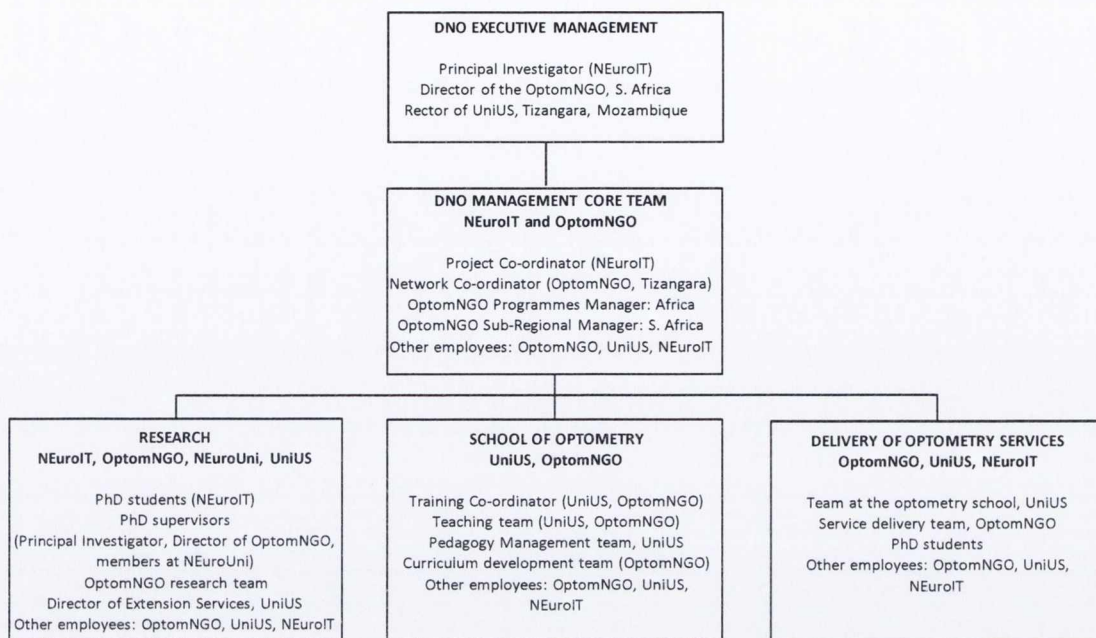


Figure 4 MozOptom DNO sub-structure

Since the MozOptom DNO focuses on the development of an optometry school at an African university and vision-centres targeted at financially-disadvantaged individuals, it is laying the foundation for long-term development. It also employs a social business model for ‘empowering’ local entrepreneurs.

1.7.3 Why is optometry important for innovation and development?

Optometry is generally a non-medical health profession. The minimum competencies for optometrists stipulated by the World Council of Optometry (WCO) include ‘dispensing, refracting, prescribing and the detection of disease/abnormality’ (www.worldoptometry.org). Exactly how optometry is practised, or what optometrists are allowed to do, differs by country and region. In some countries, optometrists are, by law, only allowed to do refractions and deal with ‘the healthy eye’, whereas in others, they are also allowed to perform some medical procedures (e.g. laser surgery) (e.g. in the United States).

As a health profession, optometry holds promise for contributing to both social and economic development. The link between poverty and eye health, specifically vision impairment, is now well-recognised (see the Vision 2020 Action Plan 2006-2011). Vision impairment affects the ability of people to participate in the labour force, and it affects the participation of children in school as children are often made responsible for assisting blind adults (Holden, 2007; Naidoo, 2007). The need for the development of physical facilities and skilled human resources is highlighted.

What makes optometry an interesting health profession for innovation studies is the 'dual character' of the profession. As Pullman (1996: 98) states, 'The structural nature of the optometric profession requires that the majority of optometrists act both as professional health care providers and as entrepreneurial business persons'. Many optometrists enter the retail market (e.g. optical centres in shopping centres) selling goods and services for profit. With regard to the optical side of the practice, similar to any other businessman, optometrists have to manage personnel, inventory and marketing (LaRussa, 2007). Clients of optometry practices thus 'act both as patients seeking professional health care and as consumers who need to purchase ophthalmic products' (Pullman, 1996: 98).

The rise of globalisation and ICTs presents both opportunities and challenges for the optometry profession worldwide. Similar to most professional fields, technology plays a pivotal role in supporting the development of the optometry profession by making certain procedures easier and quicker to perform, increasing the precision and quality of procedures, and extending the procedures qualified optometrists are able to do (Adams, 2004; Kokkinakis, 2006). Advancements in technology also facilitates the performance of certain procedures (e.g. refractions) by non-optometrists (i.e. those in other occupations) and the purchase of optometric goods elsewhere for cheaper (e.g. relatively cheap contact lenses sold online) (see for example, Di Stefano et al, 2004). Optometry is thus now confronted with the problem of growing competition from multinationals and emerging markets (notably China) (Di Stefano et al, 2004). International trade in optometric services and products is facilitated and regulated by the World Trade Organisation (through GATS).

The 'dual character' of optometry makes it an interesting field from an innovation and development perspective. It can provide public goods and produce business enterprises offering not only services (e.g. detection of abnormalities), but also goods for profit (e.g. spectacles, contact lenses, etc.). Optometry thus shows high potential for social business. In low-income contexts, both commercial and social innovation is required as a way of contributing to both economic and social development.

The need for improvements in eye-care services in Mozambique is discussed next, after a brief description of the socio-economic context.

1.8 Socio-economic context⁶

Mozambique is located in the eastern region of Africa and is part of the Southern African Development Community (SADC). It is a coastal country sharing borders with Tanzania, Malawi, Zambia, Zimbabwe, South Africa and Swaziland. It achieved independence in 1975 and went through a long period of civil war that ended in 1992. Several local languages are spoken in Mozambique, but Portuguese is the official language and English is widely spoken in business and academia, mainly in the capital city (Maputo). The country is prone to drought and flooding, mainly in the southern and central areas. According to United Nations statistics, in 2010, Mozambique had an estimated population of 23,391 million and a population density of 29.2 people per square kilometre (of a total surface area of 801,590 square kilometres). In 2011, almost 70 per cent of the total population lived in rural areas, relying mainly on subsistence and smallholder farming. Only 29 per cent of the population was reported to have access to improved water sources in 2010, a one per cent increase from 2006.

Although Mozambique has reported some improvements in human development in recent years, Mozambique is still classified as one of the least developed countries in the world by the United Nations. With a ranking of 184 on the United Nation's human development index (HDI), it has the second lowest HDI rank in the SADC.

Mozambique has showed an average growth rate of approximately seven per cent in recent years. Its gross-national income per capita (460 USD in 2011) has increased steadily since 2000, but falls below the averages for low-income countries and sub-Saharan Africa. More than half of the population lived below the national poverty line in 2008 (54% in 2008, which is an improvement from 1996, 69.4%). The average life expectancy at birth in 2011, 50 years (about equal for males and females), is also below the averages for low-income countries and sub-Saharan Africa. Mozambique also has one of the lowest literacy rates in the SADC region: 50 per cent of the population (66.8% for females and 36.1% for males in 2009). This is a small increase from 2000 when it reported an average literacy rate of 44 per cent.

The social and economic development indicators reported above show that Mozambique has made some improvements in recent years, but not enough for it to graduate out of least

⁶ The data provided in this section was obtained from the following sources (unless stated otherwise): SADC website (www.sadc.int/member-states/mozambique/, accessed 19 April 2013); United Nations (<http://unstats.un.org>, accessed 18 April 2013); and the World Bank (<http://data.worldbank.org/country/Mozambique>, accessed 19 April 2013).

development country status. Improvements have been slow in general. The condition of health is particularly in need of attention considering the low life expectancy rates⁷.

1.8.1 The health care system in Mozambique

In Mozambique, the lack of skilled human resources for health care in general is dire and has been reported to be a major hindrance to development (see WHO Annual Report 2006 cited in the National Plan for Health Human Resource Development Mozambique 2008-2015). The World Health Organisation (WHO) has reported that, in 2004, there were only three doctors and 21 nurses per 100,000 people. These low numbers are due to low levels of training and recruitment, high attrition and high levels of change in health needs. The country has a double burden with high rates of infection from communicable (especially malaria, tuberculosis and HIV/AIDS) and non-communicable diseases (e.g. diabetes, high-blood pressure, etc.), which are on the rise due to poor health lifestyles.

The Ministry of Health relies heavily on a range of actors for assistance with the provision of health-care services. The sector is supported by 28 development assistance partners and more than 70 per cent of financing in the sector was provided by development partners (in 2008). Development assistance is provided through direct budget assistance as well as through development projects, mainly through international NGOs. Donors tend to give more attention to their priority areas (e.g. HIV/AIDS). NGOs play a major role in the health sector, conducting prevention activities at the community level and providing clinical services that the Ministry of Health is not able to provide, for example, providing services to rural areas. The WHO indicates the need for greater co-ordination and co-operation between the different actors involved in the provision of health-care services and local government bodies, and greater alignment of initiatives with national priorities.

1.8.2 Eye care in Mozambique

According to recent estimates by the Ministry of Health in Mozambique, about one per cent of the total population suffers from blindness of which 75 per cent is preventable or curable, and over half of these cases are due to cataracts (AllAfrica.com, 12 March 2012; de Barros and Kalua, 2007). The situation is made worse by the high rates of communicable and non-communicable diseases in the country. While some basic infrastructure dedicated to providing

⁷ It is recognised that poverty is a complex condition related to a host of social and development aspects. In this thesis, the focus is on health and eye care in particular.

eye-care services exists, the current facilities are insufficient for responding to the need for these services and facilities are poorly maintained due to the lack of adequate training of personnel and lack of financial resources (de Barros and Kalua, 2007).

The eye-care system is dominated by ophthalmology (a medical profession). However, there are very few ophthalmologists in the country, and the distribution between provinces and rural and urban areas is uneven. According to an international NGO, Light for the World, there were just seven local ophthalmologists in Mozambique in 2003 and all of them were based in the capital city located at the southern end of the country. The situation is similar in many low-income countries in Africa (less than one ophthalmologist per million inhabitants). The rest of the country, consisting of about 18 million people, was served by one ophthalmologist who was funded by an NGO and was based in one region, and a few other expatriate ophthalmologists on short-term contracts who were based in other regions.

Since then, some initiatives have been implemented to improve the system, mainly motivated by the Vision 2020 Action Plan (2006-2011). The Vision 2020 Action Plan is co-ordinated by the International Agency for the Prevention of Blindness (IAPB) with the support of the WHO. In Mozambique, the strategy involves collaborative efforts between the Ministry of Health and international eye-care NGOs. Currently, there is an ophthalmology department at each major hospital with ophthalmologists and other ophthalmology staff being trained at a university in the capital city and other higher education institutions in the country. The Ministry of Health has partnered with several international eye-care NGOs and higher education institutions in order to train ophthalmic technicians in the Northern region of Mozambique, which is the most populous and poorest region. The region is also a great distance from the capital city, isolating it from national government and the hub of business in the country. According to the head of the National Ophthalmology Programme, eight doctors in ophthalmology and 61 other ophthalmology staff are currently being trained and each of the 21 provinces have at least one ophthalmologist and four ophthalmic technicians in place. The strategy seems promising.

However, in a city like Tizangara, where the MozOptom DNO is working towards establishing facilities for optometry training and services, there is a huge backlog of work with the small group of staff expected to serve about four million people (www.sightsavers.org, accessed 18 April 2013). This region is served by one central hospital, which has an ophthalmology

department consisting of two ophthalmologists (one acting as the Director of the hospital as well) and four ophthalmic technicians. The department recently received new equipment and funding from a large well-established international NGO, but since the hospital only has one theatre for surgery, which is shared by all departments, what the staff in the ophthalmology department is able to do in a week is restricted (www.sightsavers.org, accessed 18 April 2013). There is also a lack of diversity in human resources in the system. The system consists of a few ophthalmologists supported by ophthalmic technicians and refractionists (similar to refraction opticians and optometry technicians). Unlike eye-care systems in higher-income countries, the system does not include optometrists. The system also lacks important support staff (e.g. theatre nurses), resulting in technicians performing duties normally carried out by support staff. A problem highlighted by international NGOs is that human resource management in the eye-care system is centrally controlled by the Head of the National Ophthalmology Programme, the National Eye-care Co-ordinator (de Barros and Kalua, 2007: 22; also confirmed by data gathered during the fieldwork).

Taking into account the state of the eye-care system in the country, in the isolated provinces in the North in particular, the need for initiatives aimed at developing human resources with external funding is clear. Against the background of high rates of communicable and non-communicable diseases and a dire need for health-care human resources to address these problems, the high rates of preventable blindness and vision impairment are not priorities for government. Collaborative initiatives like the MozOptom DNO thus plays an important role in compensating for the lack of state funding and resources dedicated to eye care in the country.

The MozOptom DNO aimed to develop optometry capacity in the eye-care system, starting with the more isolated northern region of the country. The dominance of ophthalmology professionals in the eye-care system raises the question of whether the introduction of the optometry profession into the eye-care system is needed. The present research study found that the need from within the country was identified and motivated mainly by the management at UniUS (the university where the optometry training programme was established by the MozOptom DNO) and not from the ophthalmologists running the system, at least not for the under-resourced public sector (see Chapter 5).

Interestingly, ophthalmology (a medical eye-care profession) and optometry (a non-medical eye-care profession) are traditionally rival professions. As a medical profession,

ophthalmology generally holds the more dominant and powerful position internationally. It is often indicated in the literature on the sociology of professions that medicine is one of the oldest and thus most well-established and prestigious professions (see for example, Freidson, 1986; Larson, 1977). Also, optometric education and practise are not as standardised as well-established medical professions (Di Stefano et al, 2004). This situation is, however, changing with the introduction of various regulatory bodies (e.g. The European Council of Optometry and Optics-ECOO, South African Optometric Association, etc.). Conflict between the professions is not reported in all countries (see for example, Ingram and Culham, 2001). Some authors have suggested that optometrists should play a more complementary role to ophthalmologists in countries where ophthalmologists have long waiting lists in order to reduce demand on ophthalmologists and free up some time for them to focus on treating more complex cases (Lemoine, 1978; Stevens et al, 2000). In this way, the efficiency of the eye-care system could be improved.

1.9 Significance of the research

In the present research, 'the network' is explored as metaphor and method. My contribution to knowledge is thus threefold.

Firstly, I propose the concept, development network organisation (DNO), as an alternative conception of new networked organisational forms emerging in the field of development. The concept, 'network organisation', was borrowed from the business literature (e.g. Borgatti, 2001; Borgatti and Foster, 2003). It has been found to be useful in the context of development and has been suggested for other sectors as well. For example, Holohan (2005) used the concept in her research on a United Nations development intervention in Kosovo, and Peterson (2007) suggests that viewing higher education institutions (HEIs) as part of network organisational forms provides a better understanding of HEIs as organisations. In the field of development, especially with regard to aid-funded and 'North-South' initiatives, referring to transnational inter-organisational initiatives as network organisations avoids the aid 'donor' and 'recipient' dichotomy which is wrapped up in the discourse of 'old' development models perpetuating power relations associated with 'donor-recipient' relations. Of course, in practice, it has to go beyond terminology and rhetoric or we risk perpetuating the current situation of terms like 'partnership', 'networks' and 'collaboration' being used as buzzwords in development while 'old' models of unequal power relations continue to exist in practice. This thesis provides empirically grounded insight into DNOs, addressing a gap in understanding

about how these organisational structures emerge and operate in practice. The research thus provides a 'fresh' way of looking at an 'old' problem, that is, the contribution of 'North-South' development networks to the development of STI capacity.

Secondly, in order to address the problem of lack of adequate analytical tools for analysing new networked organisational forms emerging in the field of development and their role in STI capacity-building, I show the usefulness of a network-institutional approach for analysing the role of DNOs specifically. The approach was first introduced by Owen-Smith and Powell (2008) for analysing (product) innovation networks. The network-institutional approach proposed in this thesis draws on tools from social network analysis and new institutionalist theories, specifically Fligstein and McAdam's theory of fields. I argue that an understanding of both network morphology and the institutions governing the social network(s), as well as what actors actually do to produce and reproduce networks, is essential. The usefulness of other analytical approaches in the development, innovation and social network analysis literature is acknowledged, specifically innovation systems, social-constructionist and actor-oriented approaches, and social network analysis. These approaches, however, tend to emphasise either the structural or the institutional aspects of networks. In this thesis, I show how a network-institutional approach brings both into focus.

The research thus contributes to the new developments in the social network analysis literature responding to the need for integrating qualitative and quantitative methods for increasing the explanatory power of social network analysis. In elaborating on a network-institutional analytical approach, the research goes beyond suggesting improvements to methodology to suggesting ways in which network theory can be extending to move beyond the focus on networks as transmission systems, as Edwards and Crossley (2009), Knox et al (2006) and Mische (2003, 2011), among others, have highlighted recently.

Thirdly, the present research study presents a grounded understanding of the developmental role of a young African university located in a relatively isolated rural region. Much of the empirical literature on African universities tends to focus on the well-established, colonial universities located in capital cities or on well-established university centres. Also, research on African universities tends to focus on highlighting context-related challenges, especially the lack of resources. Not much is known about how these universities respond to the challenges presented by the local and global contexts, specifically the strategies they employ for

responding to the needs of the context, in driving economic and social development in their local contexts. Innovation researchers, in particular, grapple with understanding the role that these universities currently play in innovation in low-income countries in Africa (as discussed earlier in this chapter).

Besides being useful for other researchers working in the area of development, the research would be useful for those involved in designing development projects, especially aid-funded, transnational inter-organisational networks and development policy. Others who may find the research useful are researchers in the field of the sociology of higher education, which tends to focus more on higher education institutions in middle- and high-income countries.

1.10 Outline of the thesis

In this chapter, the main trends in the development and innovation studies literature was discussed, with a focus on the role of development networks in the development of science, technology and innovation (STI) in low-income countries in Africa. Gaps in knowledge are identified as well as how the present research study addresses these gaps. The second part of the chapter presents the main aims of the present research and describes the development project studied for the purposes of the research. The context in which the development network organisation (DNO) implementing the project, is embedded, is described.

The analytical approach utilised in the present research is a network-institutional approach, which is discussed in *Chapter 2*. The chapter highlights the usefulness of the network-institutional approach for analysing DNOs. Where the network-institutional approach proposed in this thesis fits in into the social network analysis literature, is discussed. The mixed methods research design employed in applying the network-institutional approach to the analysis of a case study is described in *Chapter 3*. The research was conducted in three stages and included quantitative methods of data collection (online survey) and analysis (structural network analysis using Pajek), and qualitative methods of data collection (semi-structured depth interviews and ethnography) and analysis (thematic coding). I discuss how the philosophical issues related to mixed research designs are resolved in social network research and how the ethical considerations specific to social network analysis are addressed.

Chapter 4 is the first chapter of the thesis that focuses on the analysis of the data. In this chapter, UniUS, where the optometry school has been established, is described with a focus

on the developmental role it plays in the local context. The chapter provides a detailed description of the context of UniUS as an inter-dependent field of the MozOptom DNO, indicating the context-related challenges that UniUS experiences and how it addresses these challenges. The importance of working through social networks, local and international, is highlighted.

In this thesis, I firstly take a macro view in discussing the way in which the MozOptom DNO is working towards transforming the field of eye care in Mozambique. This is the focus of *Chapter 5*. In the chapter, I address the question, what is needed to develop capacity from scratch, that is, without existing expertise for teaching, physical facilities (e.g. classroom) or equipment? Also, what are the challenges and how are these addressed by social technologies like the MozOptom DNO?

How the development objectives of the MozOptom DNO were identified and how the agenda within the DNO is steered provide some insights into whose needs the DNO serves. I argue that the structure of and dynamics of relations within DNOs shape the 'development outputs' of the DNO. This necessitates an in-depth micro analysis of the DNO, essentially an opening of this 'black box'. I describe the analytical tools provided by the network-institutional approach in *Chapters 2 and 3*. The structure and dynamics of relations among the actors involved in the MozOptom DNO is explored in *Chapters 6, 7, 8 and 9*.

Drawing on the most commonly-used analytical tools in the social network analysis toolkit (degree centrality, betweenness centrality and closeness centrality), a detailed analysis of the structure of the MozOptom DNO is provided in *Chapter 6*. The analysis is enriched by the strategy of analysing network structure from different perspectives: formal (work-related) and informal (non-work related or 'friendship') relations among all of the key actors in the network, and ego-centred decision-making networks.

In *Chapter 7*, I present the 'story' of the MozOptom DNO, starting with a description of why and how it emerged, and the incremental and radical (crises) transformations in network structure and dynamics. How the network institutions, that is the 'rules' guiding behaviour, were produced and reproduced and challenged are also discussed. The issue of power is discussed further in *Chapter 8*.

The core actors of the MozOptom DNO are based at organisations located in three different countries on two continents. Hence, like all network organisations, the communication strategy of the DNO includes face-to-face communication, telephonic as well as computer-mediated communication. These communication strategies are discussed in *Chapter 9*. How the different modes of communication were utilised and the differing purposes of each are discussed. The impact of the poor ICT infrastructure in Mozambique is highlighted.

Chapter 10 concludes the thesis. In the chapter, I discuss the implications of the main findings and the limitations of the research, and provide recommendations for further research.

Chapter 2 Theoretical concepts

In Chapter 1, the problem of finding appropriate analytical tools and methods for analysing network organisational forms emerging in the field of development was highlighted. In this thesis, I attempt to address this problem by exploring the role of a development network organisation (i.e. the MozOptom DNO) in developing optometry capacity in Mozambique, from a network perspective. From a network perspective, development is rooted in social networks and is thus shaped by the ideas, values and behaviours of individuals (Bebbington and Kothari, 2006). The perspective thus provides an understanding of development networks that is different from individualist and attribute-based perspectives although it incorporates key ideas in these perspectives (see Marin and Wellman, 2011). As indicated in the previous chapter, a perspective that simultaneously brings into focus the information and resource flows (i.e. network structure) as well as the dynamics of relations and agency of actors in networks is needed in order to address the gap in understanding with regard to the role of DNOs in STI capacity-building. I argue that taking a network perspective to analysing DNOs provides the means for a 'fresh' look at DNOs.

The main goal of the MozOptom DNO is to develop optometry capacity in Mozambique, starting with the development of an optometry training programme at an African university located in a relatively isolated and rural region of the country. The aim is thus to develop capacity, firstly through the development of an optometry professional community. Considering that participating in the DNO was one strategy that the African university used to to expand the university and meet needs of the local context, the analysis of the DNO informs an understanding of the developmental role that the African university plays.

Since the analysis focuses on the role of a DNO in developing STI capacity, the research lies on the borders of the social network analysis, organisational-institutionalist, development, innovation studies and the sociology of professions literature. In this chapter, the theoretical concepts informing the analysis are discussed. I propose the use of a network-institutional approach for analysing DNOs. From the network-institutional perspective proposed in this thesis, DNOs are conceptualised as dynamic, socially-constructed mesolevel social orders where actors are constantly negotiating and renegotiating the rules and vying for position, either in reproducing or in challenging the status quo (depending on their status in the DNO).

Collective action is most important in network organisations and thus co-operation among network members is key. Five characteristics of network organisations that facilitate co-operation include: 1) the tendency to organise the network around a common mission and identity, 2) a network structure designed for efficient information-sharing and information-processing, 3) institutions guiding behaviour and social mechanisms of control, 4) the centrality of individuals, and 5) the importance of face-to-face communication and ICTs in facilitating communication (see Borgatti, 2001; Borgatti and Foster, 2003; Holohan, 2005; Nohria and Eccles, 1992; Powell, 1990). Each of these characteristics is discussed below, drawing on the relevant literature.

The characteristics of network organisations are firstly identified. This is followed by a discussion of the social network analysis (SNA) literature, with a focus on describing trends in 'network theory'. Thirdly, a conception of networks as 'fields' is presented, drawing on key ideas in the neo-institutionalist (hereinafter to be referred to as 'institutionalist') literature. In the fourth section, key ideas in the sociology of professions literature are discussed. This literature provides additional insight into the development of professional communities.

2.1 Network organisations

A network is generally defined as, "...a collection of objects connected to each other in some fashion" (Watts 2003, p. 27). From the network organisational literature, we understand that network organisations are organic (as opposed to mechanistic or bureaucratic) structures, are more flexible than hierarchies and have more control than markets (see Burns and Stalker, 1961). Network organisations thus emerge in highly unpredictable environments like the field of development, which is characterised by rapid change (Watts, 2003). Castells (2000b: 15) states that 'for the first time, the introduction of new information/communication technologies allows networks to keep their flexibility and adaptability, thus asserting their evolutionary nature'.

According to Burns and Stalker (1961: 106), another characteristic of network organisations is that 'it becomes far less feasible to distinguish "informal" from "formal" organization'. This characteristic is evident in accounts on network organisations in businesses, for example, Saxenian's (1994) research on Silicon Valley.

Since 'coordinated action' in network organisations is 'rarely routine' as it requires individuals to act under conditions of high levels of ambiguity⁸, how to effectively co-ordinate action for achieving the common goals of the network is a major challenge (Nohria and Eccles, 1992: 288). Social mechanisms rather than legally binding contracts are utilised for co-ordinating network relations and activities (Jones et al, 1997). Network organisations thus tend to have more horizontal lines of control. Social mechanisms governing networks include restricting access to exchanges, sanctioning, punishing and rewarding. Since networks are organised around the logic of the inclusion and exclusion of actors, depending on their value for the mission or purpose of the network, 'deviant actors' may be faded out or marginalised (see Castells, 1999). The emphasis on social mechanisms of control indicates the importance of institutions in network organisations, as social mechanisms for control are only exercised when the need arises. The rest of the time, the network is 'self-governed'.

Although networks do not typically have the hierarchical lines of control of bureaucratic structures, there is some stratification and the 'authority' 'is taken by whoever shows himself most informed and capable (i.e., the "best authority")'. The location of authority is settled by consensus' (Burns and Stalker, 1961: 106). However, in networks some actors tend to have greater influence than others and networks typically include hubs that tend to hold greater power (see Barabasi, 2002). According to Castells (2011), power is exercised within and through networks. Social network theory is particularly useful for understanding bridging across the different interests and identities of multi-actor situations characteristic of DNOs. The 'power' that bridging actors hold in acting as intermediaries between actors, and thus controlling information flows, is highlighted in the literature (e.g. Brass and Burkhardt, 1992).

Daft and Lewin (1993: i) described the emergence of new networked organisational forms, in just about all sectors, as an 'organizational revolution'. They indicate that the organisational literature has not kept pace with the developments, which puts organisational theory at risk of becoming irrelevant. Much research has been conducted since then, as indicated by the review of inter-organisational networks by Borgatti and Foster (2003). There is a lack of consensus as to whether network organisations are new forms of organisations or a combination of markets and hierarchies or 'just a reification of organisational networks

⁸ Ambiguity refers to the blurring between different roles when individuals find that they do not hold the expertise they require to solve a problem or complete a task, and that requires a relatively rapid response (Watts, 2003).

(Borgatti and Foster, 2003: 995). The first view is adopted in much of the literature (Borgatti and Foster, 2003).

I use the term 'development network organisation' (DNO) as it captures the 'character' of the MozOptom project network – a formally-constituted organisational form consisting of a group of organisations working together, under a 'temporary quasi' 'umbrella organisation', towards a common development goal but without each of the organisations losing its integrity (Holohan, 2005: 33). The DNO includes dedicated staff, a common identity (i.e. the MozOptom DNO), common mission (i.e. to develop optometry capacity in Mozambique), and institutions governing the network. Once the common goals of the DNO are achieved, there would be no reason for the organisations to continue to work together unless new common goals are identified.

2.2 Development network organisations (DNOs)

DNOs that typically consist of aid agencies or other funding agencies and organisations in higher-income and lower-income countries are not new. According to Bebbington and Kothari (2006: 850), '(w)hat is different is the density, extension, and complexity of contemporary global networks and their propensity to channel increasingly diverse flows' driven by fast-paced developments in ICTs. The importance of DNOs as channels or pipes through which information and other resources flow has also been recognised by other development researchers (e.g. Chataway et al, 2005). DNOs act as mechanisms through which local organisations can be linked into national and international innovation networks for accessing valuable knowledge and other resources. DNOs are useful mechanisms for pooling resources, sharing risk, knowledge transfer, social learning, achieving better statuses, responding to uncertain environments and jointly developing skills and new ideas (Powell and Grodal, 2006). Considering that actors are included in network organisations according to the extent to which they can contribute to the mission of the network, these structures also benefit from the complementarity of assets. An advantage of 'networked development' is the opportunities that interaction in local and international networks present for learning, which is important for developing new competencies (Johnson and Andersen, 2012; Johnson and Lundvall, 2003; Oyelaran-Oyeyinka, 2006). This strategy is particularly important for organisations in resource-poor contexts, but the ability to link into and benefit from linking into networks requires adequate information-processing skill and adequate ICT infrastructure (Castells, 1999). Organisation around the achievement of a common goal (e.g. the development of a new

vaccine) has also been shown to contribute to the successful achievement of development goals (see Chataway et al, 2005).

Also problematic is the lack of consideration for the potential of social networks. While much attention has been given to the development of physical infrastructure and indigenous human capital, less attention has been given to the importance of access to sources of knowledge and technological connections, which are essential for overcoming constraints to developing STI capacity (Chataway et al, 2005). The emphasis on social capital in recent years has turned attention to the significant role of social networks in development. The World Bank's promotion of social capital as a key variable in economic growth and development has been very influential in spurring renewed interest on the topic (see Dasgupta and Serageldin, 2000; Grootaert and van Bastelaer, 2002). Research on social capital and innovation networks in sub-Saharan Africa has emphasised the importance of trust in facilitating economic transactions and knowledge exchange (e.g. Murphy, 2002). However, the mainstream social capital research on development tends to largely neglect power asymmetries embedded in the local social structure and local meanings with regard to different aspects of social capital, and tends to apply social capital in a more mechanistic fashion (van Staveren and Knorringa, 2008; Serra, 2011). Other limitations of the mainstream social capital literature are reported later in this chapter.

Very few authors, who have researched DNOs, have analysed the role of aid agencies (or 'donors') in the network and power dynamics (e.g. Lister, 1999). Furthermore, although transnational inter-organisational structures are common in development, little research has been conducted on the morphology of the social structure and dynamics of relations among the individuals involved in such organisational structures (Tronca, 2011). A limitation of the empirical research on network organisations, in general, is the focus on dyadic linkages or a focal organisation (Powell and Grodal, 2006).

2.3 Social network analysis – definitions, history, perspectives

Social network analysis (SNA) dates back to the 1930s when Lewin (1936) and Moreno (1934) produced the first writings explicitly on 'networks' (Carrington and Scott, 2011). In the past decade or so there has been an explosion of literature employing formal SNA, such that some authors have referred to the emerging field as the 'new science of networks' (Barabasi, 2002; Watts, 2003, 2004). Although SNA is now a well-established field, there has been much debate

as to whether it presents a theoretical understanding of networks or whether it is mainly a methodology. A view that many SNA researchers agree with is that it 'is peculiarly both a theory – a way of looking at the world – and a methodology – a set of techniques for making sense of it' (Wellman, 2008: 221). Hence, the terms 'approach' and 'perspective' are commonly used to describe it. Freeman (2011) identified 'four defining properties' (Freeman, 2011: 26):

1) It involves the intuition that links among social actors are important; 2) it is based on the collection and analysis of data that record social relations that link actors; 3) it draws heavily on graphic imagery to reveal and display the patterning of those links; and 4) it develops mathematical and computational models to describe and explain those patterns.

There is general agreement among SNA researchers with regard to the first three characteristics, but a split in the community exists with regard to the emphasis on structure and quantitative methods (see Wellman, 2008). The fourth characteristic is rooted in sociology, which has dominated the field since the 1970s, around the time when anthropologists began to shift focus to other methods (White and Johansen, 2005). Well-developed quantitative SNA tools have been produced over the years, with the help of other disciplines (mainly physics), and is a major reason for the rapid increase in popularity of formal SNA in just about all disciplines in recent years (see Borgatti and Foster, 2003; Watts, 2003). This strand of SNA is commonly referred to as formal SNA.

The anthropological focus on culture and the dynamics of relations among network members was most influential in the field from the 1950s to the 1970s, starting with notable contributions by social anthropologists at Manchester University – Radcliffe-Brown, Clyde Mitchell, John Barnes and Elizabeth Bott (see Carrington and Scott, 2011; Scott, 2001).

2.4 Understandings of network theory

The brief description of historical trends in the field of SNA provided here indicates the different, inter-related perspectives in SNA (for more detailed historical accounts, see Freeman, 2011; Marin and Wellman, 2011; Mische, 2011; Scott, 2001). The theoretical understandings of networks from SNA perspectives have been highlighted recently (see Borgatti and Lopez-Kidwell, 2011; Mische, 2011; Marin and Wellman, 2011).

2.4.1 Theoretical framings emphasising the structural elements of networks

Borgatti and Lopez-Kidwell (2011: 43-47) identify two main theoretical perspectives of social networks in the literature: 1) 'the network flow model' and 2) 'the network architecture model'. The former emphasises the flow of resources through network ties, whereas the latter emphasises the value of ties or contacts in terms of their direct access to resources (i.e. they possess the resources), and their indirect access to resources (i.e. through their contacts that possess useful resources). The network flow model includes small-world theory (Watts, 2003), structural hole theory (Burt, 2005), social capital theory (Coleman, 1988) and the strength of weak ties thesis (Granovetter, 1983). This model, along with the mathematical tools for empirical analysis (e.g. betweenness centrality), is most common in the literature. Researchers using this model tend to take the perspective of networks as pipes or transmission mechanisms.

Nan Lin's (1999a, 1999b) social resource theory and White et al's (1976 in Borgatti and Lopez-Kidwell, 2011) structural theory (using blockmodelling as a method of analysis) are examples of the network architecture model. With this model, the mechanism for achieving some form of capital or trait is through who we know and how well-connected their contacts are. Emphasis is placed on the accessibility of resources through contacts, which is similar to the network flow model except that with the network architecture model the contacts act on behalf of their contacts rather than through transferring their resources (e.g. judges using their status and power to act on behalf of others). For both models, information flows/communication and roles/position in the network are key for understanding the achievement of capital or traits. This view of the theory focuses mainly on the structural aspects of networks, but institutions are not completely bracketed out. For example, social capital theories highlight the role that institutions like trust play in forming and maintaining certain types of ties (i.e. weak or strong ties) (as discussed above). The links between institutions, network structure and agency have been given more attention in recent years. This is indicated by Mische's (2011) summary of network theories.

2.4.2 Theoretical framings emphasising the links between institutions, agency and networks

Recently, there has been growing interest in the links between institutions, networks and agency. Mische (2011) summarises this work. She identifies four approaches in the literature:

'networks as conduits for culture'⁹, 'networks as shaping culture (or vice versa)', 'networks as cultural forms' and 'networks as culture via interaction'.

The first two approaches encompasses Borgatti and Lopez-Kidwell's (2011) two models emphasising the flows of information and network position, except Mische stipulates that the information, ideas, values, etc. that flow through networks are cultural elements. Researchers drawing on the 'networks as shaping culture (or vice versa)' approach can be further divided between those showing how identities and institutions are shaped in network clusters or enclaves (e.g. social movement theorists); those emphasising that identities are rooted in certain positions (e.g. White's emphasis on the relation between identities and structural positions); and those emphasising the role of relational intersections (bridging actors) between social networks in producing cultural resources, facilitating the formation of coalitions and developing status and cultural innovations (e.g. Granovetter's the strength of weak ties thesis).

The third and fourth approaches, 'networks of cultural forms' and 'networks as culture via interaction', are generally underrepresented in mainstream formal SNA but have been given more attention in recent years. The third approach refers to the mapping of cultural elements, including cultural concepts, categories, practices and discourse (e.g. John Mohr's work exploring the changing relations between affirmative action categories and practices) (Mische, 2011). The fourth approach largely ignores dichotomies between structure and agency, and networks and institutions inherent in other SNA approaches (Mische, 2011; see also Knox et al, 2006). This approach proposes that networks are produced through communicative framings by 'culturally embedded actors' in networks (Mische, 2011: 89; see for example, Mische, 2003). Culture is produced and reproduced through the meanings negotiated in social interaction. Researchers using this approach generally draw on the work of Erving Goffman and Victor Turner (Mische, 2011).

Approaches linking institutions, agency and networks have been found to address a major shortcoming of approaches emphasising structure: their inadequacy for capturing network dynamics and what actors actually do in networks (see Edwards and Crossley, 2009; Knox et al, 2006; Mische, 2003). This work is generally based on the work of Harrison White and his colleagues, who developed the foundations of relational sociology. Knox et al (2006: 117)

⁹ In keeping with the neo-institutionalist approach in the present research, the term, 'institutions', is preferred to the term, 'culture'.

state that the work of White and his colleagues shows a shift in thinking away from a focus on 'individual properties and qualities'. White explored 'how language emerges and shifts in relation to usage patterns in particular relational contexts' (Mische, 2011: 82). This is the underpinning of Mische and White's (1998: 703-704) research proposing that networks are embedded in 'domains' ('netdoms'). They propose that ties are associated with specific stories and signals. These are activated in interaction. Basically, we have multiple identities (e.g. friend, colleague) that are associated with a different set of stories and signals, which we switch between when appropriate. The field of 'relational' sociology was developed by Emirbayer and Goodwin (1994), who emphasised the link between network structure, culture and agency, based on the work of Harrison White (see Knox et al, 2006; Mische, 2011). Barry Wellman's work defining communities in terms of network relations or social ties rather than geographic space and how this relates to the understanding of urbanisation and social support, also contributed to the 'relational' perspective of networks (see for example, Wellman and Leighton, 1979).

Some authors have thus called for an integration of sociology's emphasis on network structure (and the corresponding quantitative methods) and anthropology's emphasis on culture (institutions) (and the corresponding qualitative methods) (e.g. Crossley and Ibrahim, 2012; Edwards, 2010; Edwards and Crossley, 2009; Knox et al, 2006). This integrated analytical approach is an emerging approach in the SNA literature, as indicated in Mische's (2011) summary of network theories.

2.5 Network-institutional approach

In this thesis, I propose an approach that combines key ideas in social network analysis (SNA) and institutionalist theories, specifically the conception of networks as fields, for analysing development network organisations (DNOs). This is one of the perspectives of networks emerging in the literature that conceives of networks along the lines of the 'networks as culture via interaction' framing described by Mische (2011; see also Martin, 2003; Owen-Smith and Powell, 2008). Owen-Smith and Powell (2008: 604) indicate the usefulness of integrating SNA and institutionalist theories in analysing network organisations producing innovations, and refer to this perspective as a 'network-institutional' approach. Mische (2011) suggests that this perspective is one of the promising directions emerging in the field of SNA.

Owen-Smith and Powell (2008: 595) argued that networks are not only transmission systems, but also 'carriers of institutional effects'. 'While institutions shape structures and condition their effects, networks generate the categories and hierarchies that help define institutions and contribute to their efficacy' (Owen-Smith and Powell, 2008: 594). They thus conceptualise networks as transmission systems and sense-mechanisms, that is, as pipes and prisms (drawing on Podolny). Owen-Smith and Powell (2008) state that the organisational-institutional and social network analysis (SNA) literatures include overlapping ideas and are thus not as separate as one may think. They discuss the four key concepts in institutional and network theory where the two overlap: fields, institutional logics, embeddedness and social capital. I too have found these concepts useful but argue that Fligstein and McAdam's (2012) theory of fields provides a more useful institutionalist approach for analysing development network organisations (DNOs) because of the focus of field theory on explaining collective action. Other authors have also researched collective action utilising social network analysis (SNA), but this research tends to lie mainly in social movement studies. Some of these authors have utilised formal SNA (i.e. quantitative methods) (e.g. Gould, 1993; Flores et al, 2012; Siegal, 2009) and others, a mixture of quantitative and qualitative methods (e.g. Crossley and Ibrahim, 2012; Edwards and Crossley, 2009; Mische, 2003). While research on collective action in social movements is of some use to research on network organisations, it does present different contexts. Major differences are that the social movement literature tends to focus on protest action (Crossley and Ibrahim, 2012) and thus on emergence and transformations rather than stabilisation (Fligstein and McAdam, 2012). As indicated above, analysing cooperation and stabilisation (as well as emergence and transformations) is important for research on DNOs.

Fligstein and McAdam (2012) elaborate on existing institutionalist theories by emphasising collective action, and provide an understanding about how fields emerge, stabilise and are transformed. They also introduce the concept of strategic skilled actors and social skill. The theory is advantageous over other institutionalist and network theories for analysing network organisations as mesolevel social orders, specifically how these organisations emerge, transform and stabilise. In this section these key concepts are discussed, drawing largely of the sociology of knowledge and Fligstein and McAdam's (2012) theory of fields.

2.5.1 Producing formal and tacit knowledge (institutions)

As indicated above, collective action is most important in network organisations. In order to achieve this, co-operation between actors in the network organisation is essential and institutions provide the meaning and rules for behaviour that facilitate co-operation and regulate behaviour (i.e. network institutions and social mechanisms for control). It is thus important to firstly define institutions and describe how institutions are formed.

In sociology, institutions are considered the building blocks of social orders (Martin, 2003). Several definitions of institutions exist (Fligstein, 2008; Nelson, 2008). Here, institutions are defined as 'multifaceted systems incorporating symbolic systems – cognitive constructions and normative rules – and regulative processes carried out through and shaping social' relations (Scott, 1995: 33).

According to Berger and Luckmann (1967), institutions are developed through a process whereby actions become institutionalised, based on our subjectivities. Essentially, human actions that are repeated frequently become habitualised if they are assigned meaning through social interaction. Through meaning-making, the habits or patterns of behaviour are assigned value. Actors that deem the habits relevant agree on the value of the habits, which then elevates these behaviours to a status of 'objective reality' ('objectivation') (Berger and Luckmann, 1967: 77-79). According to Berger and Luckmann (1967: 77-79), institutionalisation of habits takes place through three 'dialectical moments': 'objectivation', 'externalisation' and 'internalisation'. Once the constructive constructions related to the habits become internalised by individuals, they become rules or guides informing individuals' interactions. Rules that are collectively valued as guides for behaviour within a field are considered institutions. When individuals enter new fields or social spaces, they must search 'outside of themselves' to determine what is considered acceptable behaviour in the social space. Berger and Luckmann (1967) refer to this process as 'externalisation' as it is the opposite of introspection. Individuals then decide whether to learn the rules for acceptable behaviour and if the rules become internalised, the behaviours and the associated rules become institutionalised. According to Berger and Luckmann (1967), institutions control behaviour in social systems because they limit the range of acceptable behaviour and in this way, influence decision-making. They indicate that while it is possible to utilise social mechanisms for control (e.g. sanctioning), it is not possible to constantly control behaviour in this way. Institutions are important in this regard.

Institutions thus guide behaviour and decision-making, are historical in nature and are associated with specific social spaces. Furthermore, institutions are embodied in individual experience through the roles that individuals carry out, and action is embedded in institutions (Berger and Luckmann, 1967). The notion of 'embeddedness' is important for understanding behaviour, as the above discussion shows. It became popular after Granovetter (1983, 1992) introduced it as a suggestion for avoiding extreme perspectives (i.e. under- and over-socialisation) of how institutions shape economic action. Granovetter (1983) drew on Karl Polanyi's substantivist approach highlighting the role of tacit knowledge and social context in understanding economic behaviour.

In the innovation studies literature, some authors distinguish between 'formal' and 'informal' institutions or 'formal' and 'tacit' knowledge (see for example, Fagerberg and Srholec, 2010; Lundvall et al, 2009; Schoser, 1999). 'Informal institutions' refer to the more tacit institutions, that is, those that are not codified and are thus not easily shared and emulated (e.g. attitudes, routines, habits, etc.), whereas 'formal institutions' refer to physical entities (e.g. schools) and behaviours that can be recorded and emulated by others (e.g. patents, contracts, laws. etc.) (Schoser, 1999).

Above, I utilised Berger and Luckmann's (1967) theory on the sociology of knowledge in describing how informal institutions are produced. I draw on Pinch and Bijker's (1987) social constructionist explanation of how formal knowledge and physical technologies (i.e. 'formal institutions') come to exist. Pinch and Bijker (1987: 27) highlight the importance of recognising that scientific findings and technologies are shaped by multiple interpretations ('interpretive flexibility'), and that there are social limits to 'interpretive flexibility' which facilitate the development of consensus with regard to the scientific findings and technologies being produced (i.e. 'closure mechanisms'), leading to established 'truths' or 'completed technologies'. They highlight the role of different social groups or networks (i.e. networks of inventors, investors and users) in shaping technologies. This conception is useful for analysing the DNO as a socially-constructed system (a social technology) and the 'development products' it produces, as socially-constructed products. Nelson (2008; Nelson and Sampat, 2001) propose a similar approach for analysing social technologies except that they refer to the co-evolution of social technologies, physical technologies and the relevant institutional environments (referring to both formal and informal institutions) (see also Chataway et al, 2010).

Luckmann and Berger (1967) indicate that they build on the work of Alfred Schutz in their theory of the social construction of knowledge, except for Schutz's emphasis on the mechanisms by which knowledge is distributed. This is where network theory adds value. Martin (2003), for example, suggests that the theory of 'roles' or position in networks is another area where network theory can add value to the theory of fields. The concept of 'fields' is discussed next.

2.5.2 Development network organisations (DNOs) as strategic action fields

A shortcoming of earlier institutionalist theories (in organisational theory) is the common view of fields as static systems with routine processes, where rules become routine and taken-for-granted once they are institutionalised (Scott, 1995). Hence, a major criticism of the earlier institutionalist literature is the lack of explanation as to why and how fields are produced, how relations to other fields shape it, and the role that human agency plays in producing and reproducing it. The most recent wave of institutionalist theories presents notable attempts at addressing the shortcomings in the literature. The notion of fields has changed over time from 'things' that produce outcomes to being viewed more as 'relational spaces' as we gained greater understanding of inter-organisational relations and the role of wider institutional environments (Wooten and Hoffman, 2008: 137-138). Current approaches are thus more problem-driven than paradigm-driven (Davis and Marquis, 2005 in Wooten and Hoffman, 2008). In discussing key ideas in the new institutionalist theory literature on how fields emerge, transform and stabilise, this section draws mainly Fligstein and McAdam's (2012) conception of 'strategic action fields'¹⁰.

Fligstein and McAdam (2012: 9) define a strategic action field as

¹⁰ Fligstein and McAdam's theory of fields builds on existing institutional theories, especially on organisational studies, which also put forward mesolevel analyses (DiMaggio and Powell's, 1983; Meyer and Rowan, 1977; Scott and Meyer, 1983). They also base their idea of fields on Bourdieu's idea of fields as spaces in which action takes place, linking action and structure (Bourdieu and Wacquant 1992). Bourdieu proposed that individuals draw on their capital and habitus in their action and emphasised the role of power (especially competition) in fields. Fligstein and McAdam indicate that they share some of Giddens' (1979) assumptions about fields, communicated through his structuration theory, especially the idea that actors produce and reproduce fields through their actions, that they work to produce and reproduce their positions using their resources and rules in the field, and that social change takes place when actors' trust in the social structure breaks down. Giddens (1979) moves away from conceptions of actors as cultural or structural 'dopes'. According to Fligstein and McAdam, their theory of fields is based on key assumptions of these theorists, but they go beyond these theories in recognising the role of collective action in fields and in theorising about how fields emerge and are transformed. They indicate that the literature on social movements is most useful for understanding conflict within and transformations in fields but not so much how fields stabilise. See Martin (2003) for a review of different field theories and the shortcomings of field theories.

a constructed mesolevel social order in which actors (who can be individual or collective) are attuned to and interact with one another on the basis of shared (which is not to say consensual) understandings about the purposes of the field, relationships to others in the field (including who has power and why), and the rules governing legitimate action in the field.

Fligstein and McAdam (2012) suggest that strategic action fields (hereinafter referred to as fields) are the structural building blocks of collective action. Fields are socially constructed in that they are 1) produced and reproduced by their members who recognise themselves as such, 2) the boundaries of fields are fluid and blurred, and 3) 'they turn on a set of understandings fashioned over time by members of the field' (Fligstein and McAdam, 2012: 10). In network language, network organisations are organic structures, and the geometric shapes that these organisations take depend on the purpose of the network (Watts, 2003). With DNOs, the shape of the network – who is included and excluded, and the design – depends on the mission of the DNO.

According to Fligstein and McAdam (2012), individuals want and need to identify to some extent with the goings on in the field, including the rules and goals of the field, in deciding to co-operate. The rules guiding behaviour should be shared, to some degree, for the emergence and stabilisation of fields. Crises or tensions in the field are marked by a significant break in routine and a shared sense of uncertainty, whereas the existence of some degree of shared meaning among individuals is an indication of the stabilisation of the field. Shared meanings that shape fields can be categorised into four groups (Fligstein and McAdam, 2012: 10-11):

1. A general understanding of what is at stake (Bourdieu and Wacquant 1992). This refers to a condition of consensus among most in the field, rather than the perception of the goings on in the field as legitimate.
2. A general recognition of position and power status, that is, each actor is aware of who plays what role in the field and who holds more and less power.
3. A general understanding of the culture or nature of rules in the field – which behaviours would be considered acceptable and legitimate and which are unacceptable.
4. Consensual interpretive frames for all actors, that is, the different frames that actors use for making sense of others' behaviour in the field. This idea of interpretive frames is different from the commonly used notion of 'institutional logics' as more than one

interpretive frame exists according to the individual's perspective (e.g. as incumbents or challengers).

Shared meanings are produced and reproduced through interaction among actors in the field. 'Actors make moves and other actors have to interpret them, consider their options, and act in response' (Fligstein and McAdam, 2012: 12). Communication is key in this process. Furthermore, according to Padgett (2012), symbols are not simply passed from one actor to the next, they are transformed in the process by which actors in the field learn and teach each other the rules. Hence, from Padgett and Powell's (2012) network perspective, shared meanings or cultural frames and identities are produced and reproduced through teaching and learning.

Those holding more power in the field (incumbents) tend to work towards reproducing the status quo, whereas those with less power (challengers) tend to take what the system gives, but may challenge the status quo when opportunity arises. The dominant institutions guiding interaction in the field, and how work is divided and co-ordinated tend to be introduced to and reproduced in the field mainly by incumbents. Incumbents may also make alliances, which increase their power in the field, as larger groups tend to hold greater power. This may not be an intentional power trip though. Incumbents also tend to dominate the governance unit of the field, which is tasked with ensuring compliance within the field and dealing with external fields (often the state). Incumbents thus tend to have greater control over the field and influence in how it is organised. Fligstein and McAdam (2012) indicate that not much is known about how challengers and incumbents maintain their positions in the field and adapt to transformations. Although social or institutional entrepreneurship is a well-established concept in the literature, these skills are not often related to the state of the field in the literature.

In ordering the field, actors (mainly incumbents) engage in coercion, competition or co-operation (or a combination of two or three of these) resulting in forms that are either mainly co-operative arrangements (co-operative forms or coalitions) or mainly hierarchical orderings. Coalitions are mainly based on co-operation, and co-operation 'is generally rooted in a combination of shared interests and a common collective identity' (Fligstein and McAdam, 2012: 15). Coalitions can also resemble hierarchies as some actors hold more power in the field. Actors would join and continue membership in a coalition in order to access resources,

but also for the 'existential benefits that a sense of meaning and membership affords' (Fligstein and McAdam, 2012: 15). These orders are not, however, fixed as power in groups can change coalitions to hierarchies and strategic actors can use coalitions to enforce hierarchical structure.

A specific advantage of Fligstein and McAdam's (2012) theory of fields is the explanation of what individuals do in negotiating institutions and in bringing about co-operation. This is largely neglected in social network analysis, which emphasise roles in network but not what actors actually do in carrying out those roles (Edwards and Crossley; Knox et al, 2006). This is, however, emerging in the social network analysis literature (see Mische, 2011).

2.5.3 Social skill and skilled strategic actors

This section focuses on the role of social skill and skilled social actors in producing and reproducing fields, drawing mainly on Fligstein and McAdam (2012) who introduced these concepts to the theory of fields (see also Fligstein, 2001; 2008). Social skill is defined as 'the ability to induce cooperation by appealing to and helping to create shared meanings and collective identities' (Fligstein and McAdam, 2012: 46). The concept of social skill is rooted in symbolic interactionism and thus draws on the work of Goffman (1959, 1974), Joas (1996) and Mead (1934). It refers to the skill of empathetically relating to the situations of others and, in so doing, motivate and persuade them to co-operate. The emphasis on the role of the social skill of actors in producing and reproducing fields links structure and agency. Also, since 'the individual' plays a central role in DNOs – in managing and directing information flows and facilitating co-operation and regulating interaction – understanding what individuals do in DNOs is essential for understanding how DNOs operate and produce development.

All individuals possess some level of social skill that is developed through interaction, but some actors tend to be more skilled at getting people to co-operate. Drawing on Mead (1934), we understand that some people are more skilled at facilitating co-operation because they are better able to present a 'positive sense of self that resonates with others'. Fligstein and McAdam (2012) refer to these actors as skilled strategic actors. Skilled strategic actors are actors who are better at fashioning shared meanings and identities in getting people to co-operate. Identities refer to 'sets of meanings that actors have that define who they are and what they want out of a particular situation' (Fligstein and McAdam, 2012: 47).

The notion of skilled strategic actors is different from the notion of social or institutional entrepreneurs, a concept that is well-established in the literature (see DiMaggio, 1988). The difference is that strategic action is linked to 'the distinctive human capacity and *need* to fashion shared meanings and identities to ensure a viable existential ground for existence' (Fligstein and McAdam, 2012: 18). Individuals want to have a sense of belonging and sense of meaning with regard to the roles they play in fields. Individuals thus create a positive sense of self and meaning for themselves through interaction with others. Skilled strategic actors tend to be better at creating a positive sense of self and meaning that resonates with others (Mead, 1934 in Fligstein and McAdam, 2012). Skilled strategic actors do not act out of self-interest and do not have fixed goals, but are motivated by an interest in bringing about co-operation for achieving collective ends. In this way, the concept is different from the concept of the 'rational actor' (Fligstein and McAdam, 2012). Another difference is that strategically skilled actors also fashion more than one cultural frame in order to appeal to different groups in the field for facilitating co-operation. Hence, they engage in meaning making with actors in the field with whom they co-operate and compete.

The social skills skilled strategic actors employ differ according to the state of the field – emergence, stabilisation or transformation – and the role of the actor. Thus, according to Fligstein and McAdam (2012), the influence actors have in fields depends on both the social skills they possess and their structural positions in the field. In stable fields, skilled strategic actors work towards producing and reproducing the status quo. In conditions of instability, these actors act as institutional entrepreneurs, linking groups of actors and aim to appeal to common interests and identities. Under conditions of both stability and instability, the effectiveness of actors in facilitating co-operation depends on their ability to use their cognitive and communication skills, and empathy to relate to others in the field and understand their realities. The strategies that skilled strategic actors employ in getting actors in the field to co-operate include (Fligstein and McAdam, 2012: 50-53):

- using their authority in the field as a vehicle for fashioning cultural frames;
- agenda-setting;
- taking an open-ended approach by establishing what is possible and what is not and taking what the system gives;
- persuading actors that a particular decision or action is consistent with their identities and interests, that it serves their interests;

- brokering, which requires actors to present themselves as being neutral and acting in the interest of others rather than serving their own interest;
- related to brokering is convincing actors that a line of action was their idea, which may be done by allowing others to take the lead;
- fashioning a resonant collective identity, which allows others to attach their interests to a common goal; and
- isolating actors who become difficult or disruptive, which results in the strategic skilled actor becoming the sole source of information and coalition building in the field for the isolated actor.

According to Hallett (2003: 133), symbolic power ‘...is typically deployed to further entrench the reality that defines as valuable the practices that are the basis of the legitimacy’. Taking this into consideration, it is apparent that in order to effectively persuade and motivate others, skilled social actors have to present cultural frames and identities that (the target individuals) identify with, which requires some level of understanding of the individuals’ realities. The influence of such individuals thus depends on the audience. Strategic skilled actors in networks hold symbolic power that has to be legitimated by others in the network (Hallett, 2003). Strategic skilled actors often utilise impression management in fashioning cultural frames and identity in order to add to their symbolic power (Fligstein, 2001; Hallett, 2003; Serra, 2011).

2.5.4 Embeddeness – ‘field within fields’

According to Fligstein and McAdam (2012: 59), ‘Fields do not exist in a vacuum. They have relations with other strategic action fields and these relations powerfully shape the developmental history of the field’. This emphasis on how external fields shape the field of interest is a significant contribution of their theory to the literature. The notion of social action as ‘embedded’ in social relations and the wider institutional environment is pivotal for understanding how fields emerge and are transformed. While the embeddedness of fields is well-recognised in the literature, there is a tendency to isolate fields and focus on the internal workings (Fligstein and McAdam, 2012; Padgett and Powell, 2012). According to Fligstein and McAdam (2012: 18-19), external fields can be:

- distant (virtually no ties or influence on the field) or proximate (recurring ties and ties routinely influencing the field);

- fields on which the functioning of the field of interest depends completely or mutually influential ties (dependent or interdependent fields); and
- state or non-state fields.

It is through 'interaction' between fields – networks within a complex web of networks (Padgett and Powell, 2012) or fields within a complex web of fields (Fligstein and McAdam, 2012) – that fields emerge and stabilise. Padgett and Powell (2012), drawing on social network analysis, state that innovations emerge through the interaction or 'spillovers' between social networks. Spillovers occur at the intersection between fields, that is, common spaces through which resources and rules are shared.

Due to the overlap or interaction between fields, and interaction between fields and the wider institutional contexts, endogenous and exogenous challenges impact on fields throughout their lifecycle. Fields thus tend to undergo incremental transformations fairly often without destabilising the field (Fligstein and McAdam, 2012). The impact of external fields is particularly useful for the present research as it was found that external factors (e.g. Education law in Mozambique) had a significant impact on the field studied, the MozOptom development network organisation (DNO), threatening the success of the DNO in achieving its goals.

The intersections and 'spaces' between fields and the role of actors connecting fields are further theorised in network theory. The notion of social capital, which is closely linked with network theory, is valuable for analysing network organisations because it explains how certain aspects of network structure facilitate communication and information flows and co-operation (see Borgatti and Foster, 2003).

2.6 Social capital and social network analysis

The concept is essentially 'about the value of connections' and it provides an understanding of the actual mechanisms relating structural features of networks to the (positive and negative) outcomes of social relations (Borgatti and Foster, 2003: 993). Numerous different forms of social capital have been identified in the literature, depending on the author's approach to social capital and the context of the research. The most commonly identified forms of social capital include bonding social capital, bridging social capital and linking social capital (see Borgatti et al, 1998; Burt, 2001, 2005; Knorringa and van Staveren, 2008; Macke and Dilly,

2010; Patulny, 2009). Since network organisations are characterised by inter-organisational interaction, the forms of social capital essential for this type of network would be different from that of closed groups. The main role of social capital would be the facilitation of co-operation among the members within the network. The measures available in the social network analysis toolkit for analysing the different forms of social capital are reported below.

2.6.1 Dense networks and strong ties

Bonding social capital is characterised by strong ties between actors within a social structure. As Coleman (1988) shows, trust can increase with reciprocity and repeated interaction through building a positive reputation for being trustworthy; and with reciprocity, individuals (and organisations) can collect credit slips that they can draw on at any time (provided the trust was not misplaced). Furthermore, within social structures consisting of strong ties between actors, 'norms arise as attempts to limit negative external effects or encourage positive ones' by sanctioning or rewarding behaviour; and actors who interact very often tend to 'develop norms about each other's behaviour' (Coleman, 1988: S105), which facilitate interaction and co-operation. According to Coleman (1988), it cannot be assumed that such norms will always come into existence in social structures where these conditions exist.

Uzzi (1996), in combining organisation theory with social network theory in his conception of structural embeddedness, put forward an approach for exploring how the type of ties actors have and their position in a network determines their access to opportunities available in the network. Uzzi (1996) showed that co-operative thick or repetitive exchange was more beneficial for organisations as these types of ties were more effective for reducing transaction costs and risks than self-interested arms-length exchanges. Ideally networks should integrate both types of exchanges. A key element of thick exchange is trust (Uzzi, 1996; see also Borgatti and Foster, 2003; Holohan, 2005). Research on social capital and innovation networks in low-income countries in sub-Saharan Africa shows that trust plays an important role in innovation networks, particularly because of the important role of informal networks in innovation in these contexts (e.g. Gebreeyesus, 2013; Murphy, 2002). Trust, together with the identification with the 'mission' of the network organisation, is of utmost importance for loyalty and co-operation (Holohan, 2005). It should be noted that the determinants of trust are, however, not well-understood in the literature, and it is often incorrectly assumed that trust automatically leads to co-operation and that trust is required for co-operation (Coleman,

1988; Serra, 2011). Some authors have shown that individuals may co-operate even without the presence of trusting relationships (see Tomlinson, 2005; Ynalveza and Shrumb, 2011).

From Fligstein and McAdam (2012), we learn that effective control of negative external effects and the promotion of behaviour with positive effects require the possession of effective social skills by those holding symbolic power. The high levels of interaction can also facilitate information sharing within the social structure. The property of high connectivity and relatively little external links is called closure (Coleman, 1988; Burt, 2001, 2005). The strength of ties or degree of cohesiveness within social networks is investigated by measures of density, degree and closeness centrality in structural network analysis (Borgatti et al, 1998; De Nooy et al, 2005).

Although network closure can have positive effects – facilitating the development of higher levels of trust and reciprocity and norms for controlling negative behaviour, and the sharing of information within the social structure –, network closure can have undesirable effects. For example, it can stifle personal and business development as it tends to limit creativity. Social structures characterised by strong ties are often formed due to homophily, that is, the tendency to associate with those who are similar, ‘like being attracted to like’ (Watts 2003). Individuals who are similar in character tend to come from similar social environments (i.e. possess similar tacit knowledge) and tend to be linked to similar types of people, which limits access to new information. This is where the ‘strength of weak ties’ come in (see Granovetter, 1983).

2.6.2 Weak ties and bridges across horizontal and vertical relations

Burt (2001, 2005) agrees with Granovetter’s (1983) argument that, in order to access new ideas, information and ways of doing things, individuals make connections with other individuals coming from different social environments. Individuals linking into different networks are more likely to have access to different information, knowledge and resources. Burt refers to weak ties as structural holes. He indicates that these bridging actors contribute to the social capital of the networks they link into. Bridging actors also control communication and information flows, indicating their structural power (Brass and Burkhardt, 1992). As Coleman (1988) states, social capital can be appropriated in one social context and transferred to another. Also, network members that bridge networks, but do not have influence within a social network, would have to go through influential network members. Burt refers to this

process as borrowing social capital in order to influence the network. The ability to link across networks is referred to as bridging social capital. This bridging or linking across social groups implies the application of effective social skill for accessing networks. In structural network analysis, bridging social capital is investigated through measures of 'betweenness centrality' (Borgatti et al, 1998; De Nooy et al, 2005). According to Burt (2001, 2005), the value (and thus, power) of a bridging actor decreases as more bridging actors link across the same structural hole, rendering ties redundant.

Bridging social capital has been highlighted as particularly important for inter-organisational networks. Bridging actors may thus play a key role in facilitating co-operation and acting as channels of information between groups of individuals included in the collaborative network. Both network closure and network betweenness are essential in facilitating flows of information as networks would need to have some level of connectivity with other networks to access new information and be highly connected in order for information to be passed onto all or most of the network members (Burt, 2001, 2005; see also Coleman, 1988).

Linking social capital is a relatively new form of social capital that is concerned with vertical relations where power dynamics come into play (Macke and Dilly, 2010; Patulny, 2009). Like bridging social capital, linking social capital connects actors across a divide – bridging social capital refers to the links between groups and linking social capital refers to links across vertical relations. This form of social capital does not seem to have gained popularity in the literature (as yet). Patulny (2009), who operationalised linking social capital as the relations between citizens and government, states that this form of social capital is problematic and may not even exist as it has unclear lines of trust and overlaps with governance. Considering the lack of attention given to vertical relations, linking social capital may be useful in distinguishing the form of social capital related to vertical relations from horizontal relations. Here again, effective social skills are required to link across social groups. Since linking social capital has similar characteristics to bridging social capital, measures of betweenness centrality are appropriate for investigating this form of social capital.

While useful, the social capital literature has some shortcomings. Besides the inadequacy of the treatment of 'trust', the lack of attention to power relations is also problematic. This is partly due to the focus of the empirical literature on closed groups or networks (see Serra, 2011). Some authors have been particularly critical of the growing trend of developing

quantitative measures and ascertaining its determinants through economic modelling as these measures, specifically scales for measuring elements such as trust, fail to capture local meanings and path dependent features of social capital (Knorringa and van Staveren, 2008; Serra, 2011). Other criticisms are the use of weak models, with spurious correlations, and the practice, particularly by developmental economists, of taking experiments directly from the lab to the field without adequate adaption to the context (Nielsen, nd; Serra, 2011). Also, since definitions of certain relational aspects of social capital (e.g. trust) are highly subjective, survey questions about these aspects can be easily misunderstood. The research on social capital in development has also tended to focus mainly on the achievement of economic goals; and while some research on development projects has been conducted (e.g. Gugerty and Kremer, 2008; Isham and Kähkönen, 2008), the analysis has tended to focus on co-operation for the development of (general) social capital within the local setting and closed groups, thus neglecting the potential influence of relations with external organisations and funding agencies. Another problem is the presumption that more social capital is almost always good, specifically that high levels of trust within dense networks generally leads to co-operation for solving problems, which places the focus on closed groups. The key question is not how much social capital fosters development, but which types of social relations (networks) foster development, under what conditions (institutions), and how to bring this about.

Recently, there has been a call for research investigating the value and role of the concept towards opening the 'black box' of social capital (Knorringa and van Staveren, 2008; Serra, 2011). Serra (2011) suggests that greater inter-disciplinary exchange is required to understand the complexity of the concept and to overcome the shortcomings in the literature. An important point raised by Ostrom (2000) and Coleman (1988) is that all forms of capital – social, physical and human capital – are required for development.

2.7 Network resilience and contagion

Two other concepts in network theory that is useful for analysing development network organisations (DNOs) are 'contagion' and 'network resilience'.

According to Watts (2003, 2004), the idea of social contagion is useful for understanding collective action. Watts (2004: 260) posits that decisions may be 'transmitted' from one actor to the next in a manner reminiscent of the way diseases spread. Decision-makers tend to pay

attention to the decisions and actions of others with whom they make contact, especially contacts who are in a similar position in the network (Borgatti and Foster, 2003; Watts, 2003, 2004). However, unlike diseases, the effect of actions and decisions weakens the more actors experience them.

Furthermore, from network theory we learn that threats to network functioning can be endogenous or exogenous and the ability of networks to effectively deal with threats is related to network structure. In network terms, instability in networks is due to endogenous and exogenous failure (see Watts, 2003, 2004). Network organisations tend to be embedded in contexts characterised by conditions of high levels of uncertainty, rapid change and ambiguity. DNOs generally face a host of exogenous threats. Changes in law, sickness, accidents, etc. are thus common threats to development network organisations. Failure occurs when actors in the network cannot effectively manage the threat.

Endogenous failure occurs when an actor's capacity for processing information does not meet demand and thus channels of information/resource flows become congested (Watts, 2003, 2004). Actors have to possess the capability to temporarily switch roles or take on an additional role (i.e. effectively deal with ambiguity) when required. In network organisations, greater emphasis is placed on the capability of actors for effectively dealing with ambiguity and actors' specialised knowledge. Individuals are thus more central in network organisations than in hierarchies or markets (Borgatti, 2001; Burns and Stalker, 1961). Effective skill for handling both endogenous and exogenous threats is essential for network resilience.

Besides actors' capabilities for effectively dealing with exogenous and endogenous, network structure also contributes to the resilience of network organisations. According to Watts (2003, 2004), some types of organisational structures can be more resilient than others. The organisational structures that Watts suggests are best suited to dealing with ambiguity and uncertainty are structures that include teams or sub-networks arranged according to the purpose of the network organisation. This is because some level of information processing and redistribution happens at all levels rather than making this the sole task of the upper layer in the organisation. Communication flows within such a structure can thus withstand the loss of individuals or even chunks of networks as the responsibility for tasks are shared. Hubs tend to be more resilient (Barabasi, 2002). This type of structure also prevents the situation of any one person experiencing overload in information processing when requests for information

and guidance increase or where the organization is left in a critical state when one person leaves the organisation. The lines of communication and control for processing information is not, however, fixed, they adapt to the problem at hand. While there may be a more or less set procedure for dealing with routine problems, new challenges and problems are directed to the most appropriate actors in the network via the shortest paths (Baker, 1992).

2.8 Computer-assisted and face-to-face communication

Much has been written about the role of ICTs in facilitating the emergence and operation of network organisational forms (e.g. Borgatti, 2001; Castells, 2000a, 2000b; Nohria and Eccles, 1992). Access to ICTs is particularly important for facilitating communication across organisational and national borders. E-mail communication has been highlighted as a mode of communication that makes communication in organisations more egalitarian as it increases the potential for direct access to top level management (Nohria and Eccles, 1992). Computer-mediated communication (e.g. e-mail) is, however, limited in supporting certain activities, such as, establishing relationships and solving conflict. Berger and Luckmann (1967), among others, emphasise the role of face-to-face communication in establishing social orders as this mode of communication allows actors to obtain a range of information about the actors with whom they are interacting, which informs the institutions they develop for future interaction. The full range of information about an individual's identity that is available in face-to-face communication is limited in computer-mediated communication (e.g. Nohria and Eccles, 1992). Some authors studying network organisations thus emphasise both face-to-face and computer-mediated communication (Holohan, 2005).

A shortcoming of the research on the role of computer-mediated communication in network organisations is that much of it was conducted in laboratory settings or in the 1990s (Holohan, 2005, Wellman et al, 1996). There is thus a need for more recent studies, especially on the use of more recent ICT innovations (e.g. internet calls) in general and in low-income contexts, in particular, where internet access is limited.

Besides ICTs, technology in general is useful for information-storage and -processing thus supporting the ability of organisations to process information efficiently and store organisational memory (Holohan, 2005). Organisational memory captures the history of the organisation and facilitates handover from staff exiting the organisation to those entering it.

Before concluding the discussion on the theoretical underpinning of the present research, the literature on 'the professional community', as an institutionalised field of 'cultural production' (see DiMaggio, 2011: 287) is discussed. The sociology of professions literature was found to be useful for analysing the development of the optometry professional community in Mozambique, which is one of the development goals of the MozOptom DNO.

2.9 'The professional community' as a strategic action field

Since the 1970s, interactionist approaches to the analysis of professions have dominated the literature on the sociology of professions. Two dominant approaches in the sociology of professions literature include those emphasising power, how it is exercised in determining the division of labour and how the 'boundaries' of professions are negotiated and protected particularly by elites (Freidson, 1986; Johnson, 1972); and approaches emphasising action, viewing professions as autonomous social actors negotiating tasks and boundaries (Hughes, 1963; see also Macdonald, 1995; Stevens et al, 2000). Another approach is that of Abbott (1988 in Abbott, 1993) who suggested a systemic approach to analysing professions and emphasised the inter-relations between professions. While the first two approaches focus on individual professions, Abbott argues that in addition to analysing social structure and institutional factors, intra-, inter- and trans-professional forces have to be included in research on professions (Abbott, 1993). Larson (1977 in Macdonald, 1995), similar to Abbott, takes a more systemic perspective in describing the development of professions as 'the professional project'. Larson's theory builds on that of Freidson in highlighting power, particularly how the dominance of some professions in society is negotiated and maintained (see Larson, 1977; Macdonald, 1995).

In the literature, there is much debate on the difference between occupations classified as professions and those that are not, and the usefulness of the term 'profession' (Evetts, 2006). While the term may be problematic in that it is used in different ways in different contexts, there is general agreement in the sociology literature that it is a useful classification for autonomous service professions that require prolonged specialised and theoretical training (see Abbott, 1993; Evetts, 2006; Freidson, 1986; Larson, 1977; Macdonald, 1995). Exactly how long and how theoretical the training has to be, differs by profession.

The type of knowledge required by professionals tends to be formal advanced and codified knowledge on professional practice that is not easily accessible (Larson, 1977; Macdonald,

1995). Individuals may gain access to this codified knowledge through education and training. The university is thus at the centre of the 'professional project', the term used by Larson (1977) in describing the process by which professions are developed and maintained. Through higher education institutions (HEIs), professions develop and reinforce their legitimacy and autonomy. Individuals are selected for training at HEIs and those who satisfactorily obtain the cognitive requirements and internalise the specified set of institutions (code of ethics), are allowed to formally enter the community of professionals. Professionals thus undergo a process of socialisation through which they develop a specific professional identity (Larson, 1977; Macdonald, 1995). 'Professional communities' thus tend to have a shared identity and shared institutions. Professional communities are usually characterised by 'typical organisational and institutional patterns: professional associations, professional schools, and self-administered code of ethics' (Larson, 1977: x).

A norm that distinguishes professions from other occupations is trust. Lay persons depend on professionals for their (codified) knowledge on specific problems and have to trust that the solutions or advice provided by the professional are sound, and trust that the professional will not misuse any confidential information shared. Professionals thus have to be trustworthy.

Professions emerge out of efforts by a group of individuals who bring together a set of areas in the social division of labour and establish control over it so that it becomes independent of dominant ideology in the social context (see Larson, 1977). The specification of autonomy is one factor that distinguishes professions from other occupations (see Freidson, 1986; Larson, 1977). Professionals control the boundaries of the profession by exercising selectivity over who is allowed to enter the profession, and controlling the training required and how the profession is practised. The professionals produced thus tend to form part of elite social groups. This is achieved through the standardisation of training and creation of a code of ethics for practising in the profession. The guiding principles of professions are not fixed, but do not change so rapidly and frequently that they jeopardise the maintenance of universal standards (Larson, 1977). Larson (1977) points out that it is through these processes that professions claim their knowledge to be universal and legitimate. Research conducted through universities also serves to develop and reinforce the legitimacy of professions. The autonomous control that individuals have over professions is not, however, absolute as they have to negotiate control with the state and it is ultimately up to the state to decide exactly what professionals are allowed to do (Freidson, 1986; Larson, 1977).

An important characteristic of professions is their relation to key elements of modernity: knowledge and markets (see Larson, 1977). In industrialised societies knowledge is a commodity and those holding and controlling it have greater economic power and status. Professional communities thus strive for social closure, that is, control of the boundaries of the community through the means discussed above. Through controlling entry into professions and limiting the number of entrants, the value of the knowledge is controlled. The universality of professional knowledge (or claims thereof) also enhances the value of the knowledge. More recently, authors in the sociology of professions literature (e.g. Evetts, 2006) have indicated that while professional communities strive for social closure in order to gain prestige and economic power, professional communities also aim to serve public interests in the services they provide. Evetts (2006: 137) refers to the provision of services based on professional knowledge and 'the use of knowledge and power for economic gain and monopoly control (which poses a threat to civility)' as 'the dual character of professions'.

Another characteristic of professions, related to social closure and power, is the relation between professions and social strata. Larson (1977: xvi) indicates that 'professions are outside and above the working class...individual professional status is still undeniably a middle-class attribute...' Professions are thus produced through and produce conditions of social inequality. Furthermore, professions are 'Western products' with its roots in the United States and Europe (see Freidson, 1986; Larson, 1977). Professions attract interest, encourage commitment and maintain standards through rewarding professionalism (Evetts, 2006; Larson, 1977; Macdonald, 1995). Rewards include higher status, authority and economic power.

The relation of professions to social inequality is particularly pertinent for low-income countries where social inequalities are huge, but there is also a critical lack of skills resulting in dependence on expertise from more advanced countries.

2.10 Conclusion

In Chapter 1, I outlined the research problem that the present research study aims to address, that is, the lack of theoretical and empirical research on development network organisations (DNO) that act as mechanisms for developing science, technology and innovation (STI) capacity in low-income contexts in Africa. There is agreement in the literature that universities in Africa are in a unique position to serve the more immediate development needs of the

contexts in which they are embedded and also drive development (de la Harpe and van Zyl, 2012). Collaborating with others in DNOs is one strategy through which African universities perform their developmental role as DNOs present mechanisms through which African universities, which are often located in resource-poor contexts, can access relevant resources (i.e. knowledge, financial capital and physical resources) that are not easily accessible in their local contexts (see Castells, 1999; Chataway et al, 2005; Leach and Scoones, 2006). As indicated in Chapter 1, research at the macro-, meso- and micro-levels are required for gaining an understanding of how DNOs operate and the role that they play in STI-capacity-building in Africa (see Figure 5 below).

I aim to address the gaps in understanding with regard to DNOs and the developmental role of African universities (mainly through their use of DNOs) by taking a systemic perspective to the research. With the use of a network-institutional approach, I analyse a DNO (i.e. the MozOptom DNO) 'inside-out', exploring the five characteristics of DNOs identified earlier in this chapter. As indicated in this chapter, this approach conceptualises DNOs as mesolevel social orders or fields that are embedded in inter-related and inter-dependent fields, through which information and other resources are transmitted and in which collective action takes place. This analytical approach thus provides the analytical tools for the type of multi-level analysis required. The multiple levels analysed in the present research study is illustrated in Figure 5 below. This is a novel approach to exploring STI-capacity building and DNOs.

As highlighted in Figure 5, 'the DNO' presents a 'blackbox' in the literature. Figure 5 illustrates the 'complex webs of other fields' (Fligstein and McAdam, 2012: 18) in which the DNO is embedded in Tizangara, Mozambique, representing 'overlays' of each other (Padgett and Powell, 2012). In this chapter, I showed how the network-institutional approach allows for an opening of the 'blackbox', providing the analytical tools for analysing 1) network structure (information flows and structural position), 2) the institutions in which social interaction is embedded, 3) dynamics of relations, 4) the strategies that actors utilise for facilitating co-operation for achieving collective action (i.e. social skill), and 5) human agency more generally. The commitment of SNA to the collection of 'fine-grained relational data' on interaction through time is most useful in this regard (Padgett and Powell, 2012: 3). However, as indicated earlier, the quantitative methods of formal SNA is an advantage of formal SNA, but quantitative methods are not useful for collecting data on and analysing institutions and social skill.

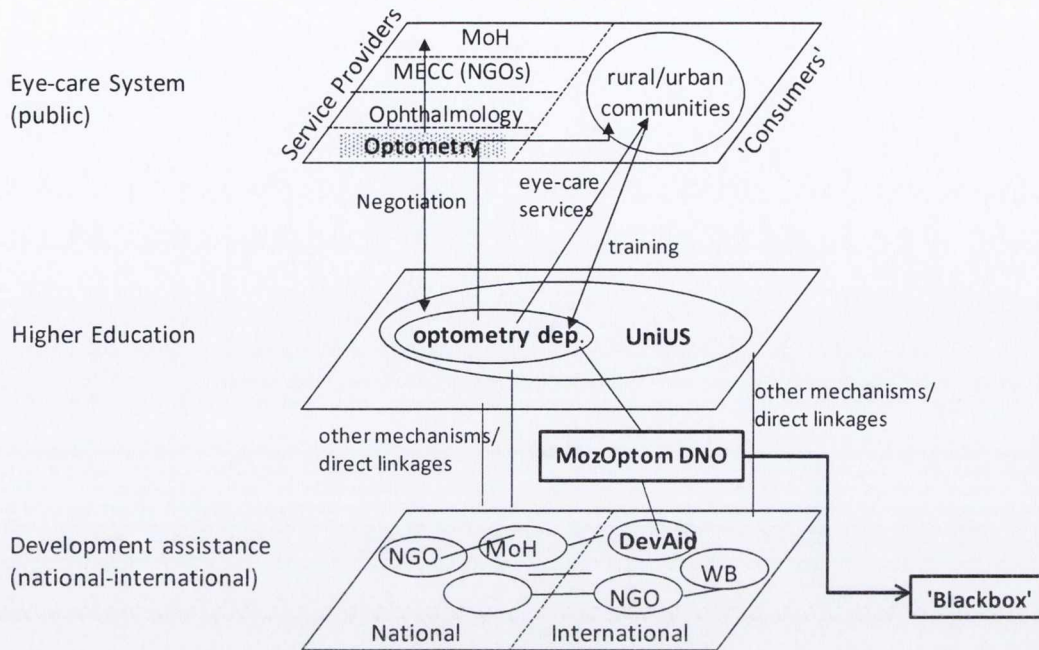


Figure 5 Multi-level analysis of the present research study

Note: 'Optometry' is shaded over as the optometry profession has not been officially recognised by the Ministry of Health in Mozambique.

A contribution of the present research study to the literature is the application of a network-institutional perspective with the use of mixed methods SNA. Mixed methods SNA has been given increasing attention in the literature as authors have raised the limitations of using quantitative methods only, which does not allow for the investigation of the process components of networks (see Edwards, 2010; Knox et al, 2006). The present research study contributes to these efforts. The next chapter provides a detailed description of the methodology employed.

Chapter 3 Mixed methods social network analysis

In the literature, two main views of networks are evident: networks as transmission mechanisms and networks as sense-making systems (the previous chapter provides a more detailed discussion). Until recently, the focus of the social network analysis (SNA) literature has been on the former and thus emphasis has been placed on analysing the structural components of networks or 'measures over meaning' (see Edwards and Crossley, 2009). This trend has been supported by rapid advancements in computer-assisted analysis that have made mathematical analysis techniques more accessible. While the usefulness of the SNA toolkit is an advantage of SNA, much of the criticism of the field is due to this emphasis (see Fligstein and McAdam, 2012; Long, 2001). A recent trend emerging in the literature is the integration of methods typically used in formal SNA (i.e. mainly sociological approaches using mathematical modelling techniques) and SNA rooted in anthropology (employing mainly qualitative methods), with the aim of understanding social networks as both transmission systems and sense-making systems (see Edwards 2010; Mische, 2003; White and Johansen, 2005). This approach to analysing social networks provides a theoretical underpinning to SNA, which is lacking in the literature (Knox et al, 2006).

In the present research, network structure, dynamics of relations and network institutions are analysed with the use of a network-institutional approach (discussed in Chapter 2). No single research method can meet the challenge of analysing these three aspects of social networks. A mixed methods research approach is required. Although several authors have raised concern about combining methods or research techniques tied to different epistemological perspectives in a single study, there is general consensus in the mixed methods research (see Onwughiezie et al, 2009; Small, 2011) and SNA (see Edwards, 2010; Edwards and Crossley, 2009) literature that SNA is one research approach that lends itself more to using mixed methods research. Why this is the case, is discussed later in this chapter.

The aim of the present research study is to explore both the structural and process components of an aid-funded development network organisation (DNO) aimed at developing capacity for the provision of optometry services in Mozambique. The DNO, the MozOptom DNO, includes four autonomous organisations located in three different countries temporarily working together under one umbrella for achieving common development goals (see the definitions of network organisations by Borgatti, 2001; Holohan, 2005). The approach also allows for a critical stance which is particularly important in the field of development where

networks/partnerships/collaborations have become buzzwords despite the continued prevalence of unequal power relations (see Edejer, 1999; Hall, 2002; Junghanss, 2005; MacLachlan et al, 2010). While SNA, both quantitative (e.g. Macke and Dilly, 2010) and qualitative (e.g. Holohan, 2005), has been used in analysing development initiatives in recent years, using mixed methods SNA for analysing development initiatives is a novel approach. Notable in-depth research on aid agencies and the role of aid agencies in development have employed ethnographic research (e.g. Mosse, 2005), but these studies have not employed SNA. The use of a network-institutional approach, which I propose in this thesis, is another novelty.

A mixed methods research approach is argued to be essential for addressing the main research questions: What is the structure and dynamics of relations among actors in the DNO? Which factors shape the structural attributes of the network and dynamics of relations? How does the structural attributes and dynamics of relations impact on the achievement of development goals?

In this chapter, the mixed methods methodology employed in the present research study is described. The quantitative methods employed include: a survey, structural network analysis (commonly referred to as formal network analysis in the literature) and descriptive statistics. The qualitative methods include semi-structured depth interviews and ethnographic research methods (including interviews, focus group discussions and participant observation). Why these methods were selected and how they are employed in addressing the research questions is discussed in detail below. Considering that mixed methods research (MMR) is an emerging and controversial field in the social sciences, it is important to firstly provide a definition of MMR and discuss the advantages and shortcomings of this methodology. Secondly, the use of MMR in SNA is discussed, followed by a detailed description of the methods employed and procedures followed in conducting the research. For the sake of clarity, the description of the methodology employed is divided into the different stages in which the research was conducted (i.e. Stages 1, 2 and 3). This is followed by a reflection on the research process. In the last section, the ethical considerations presented during the research process are discussed.

3.1 Mixed methods research – definition, advantages and shortcomings

Mixed methods research is the research paradigm that (a) partners with the philosophy of pragmatism in one of its forms (left, right, middle); (b) follows the logic of mixed methods research (including the logic of the fundamental principle and any other useful logics imported from qualitative or quantitative research that are helpful for producing defensible and usable research findings); (c) relies on qualitative and quantitative viewpoints, data collection, analysis, and inference techniques combined according to the logic of mixed methods research to address one's research question(s); and (d) is cognizant, appreciative, and inclusive of local and broader sociopolitical realities, resources, and needs (Johnson et al, 2007: 129).

This comprehensive definition of MMR is based on an integration of ideas from several leaders in the field. Small (2011), on the other hand, deems the quantitative and qualitative dichotomy problematic. He distinguishes between mixed data collection studies (i.e. including at least two kinds of data or two means of collecting data) and mixed data analysis studies (i.e. studies either utilising at least two analytical techniques or crossing analytical techniques and data types) in defining MMR. Crossover analysis refers to the analysis of qualitative data with quantitative analysis techniques and vice versa.

Today, researchers seem to be more open to combining qualitative and quantitative methods and promoting methods from other research traditions in addressing questions that the methods they employ cannot (Small, 2011). Two reasons for the increase in popularity of mixed methods research (MMR) are 1) the increasing frustration researchers are experiencing due to the limitations of their approaches for addressing certain research questions, and 2) advancements in software for analysing (both qualitative and quantitative) data (Onwuegbuzie et al, 2007; Small, 2011). Advancements in computer-assisted analysis have generally accelerated the prevalence of crossover analysis, which has long been utilised in content analysis and quantitative anthropology (Small, 2011) and factor analysis (Onwuegbuzie et al, 2009). MMR is increasingly recognised as a third research paradigm, next to quantitative and qualitative research (Johnson et al, 2007; Onwuegbuzie et al, 2007). The field is fast becoming institutionalised with dedicated MMR academic journals, conferences and handbooks.

Although MMR is gaining popularity in the social sciences, characterising MMR is not 'straight forward' for two reasons: 1) it is an emerging methodology and thus there is no consensus with regard to its analytical underpinnings, and related to this point is 2) the question of whether MMR constitutes a third methodology rather than just a derivative methodological strategy (Small, 2011: 58). Much of the controversy of MMR is related to the fact that combining quantitative and qualitative methods implies the 'crossing' of paradigms that are incommensurable. This argument is often referred to as the incompatibility thesis (Denzin and Lincoln, 2011; Teddlie and Tashakkori, 2011). Mixed methods researchers have thus been criticised for ignoring the epistemological underpinnings of the methods being combined. Small (2011) explains that each set of research techniques is based on a set of underlying assumptions about the knowledge they produce. The validity and credibility of the data comes into question when the relevant underlying assumptions and quality checks are ignored (Lincoln et al, 2011).

Several researchers have pointed out that, in practice, research in the most dominant research traditions (postpositivism, constructivism, critical theory and participatory research) combine quantitative and qualitative methods to some extent, and mixing methods in a single study is not new. Hence, proponents of the incompatibility thesis are criticised for their tendency to overstate how closely tied research techniques and epistemological perspectives are (Onwuegbuzie et al, 2009; Small, 2011). Bazeley (2009) states that the debates on crossing or combining paradigms may have sharpened thinking in MMR but hinder the development of the field. Whether or not research methods are commensurable depends on how closely the methods are tied to the epistemological perspectives that inform them, and thus some analytical approaches lend more to combining methods (e.g. network analysis) than others (e.g. ethnomethodology) (Lincoln et al, 2011b; Small, 2011).

Considering the criticism of the lack of epistemological underpinning, it is surprising that mixed methods researchers have not given much attention to discussing the philosophical underpinnings of MMR, as Onwuegbuzie et al (2009) point out. Mixed methods researchers have proposed a pragmatist research approach or paradigm as providing epistemological justification for combining research methods in a single study and the logic guiding the research (Creswell, 2011; Onwuegbuzie et al, 2009; Teddlie and Tashakkori, 2011). Pragmatist researchers are guided foremost by the concern for finding the most appropriate methods for developing and addressing their research questions. It is for this reason that MMR is thought

to yield findings and outcomes that are often superior to research using a single method (Onwuegbuzie et al, 2009).

Some authors, however, disagree with pragmatism as a research paradigm (Denzin, 2012; Lincoln and Denzin, 2011; Small, 2011). Small (2011: 63) states that, 'Pragmatism may turn out merely to help authors avoid, rather than address, important questions'. He argues that not drawing on methodological research in traditional disciplines may threaten the development of strategies for mixed methods research, and that the pressure for specialisation may actually be hindering this. A problem with the literature is that researchers often do not justify their approaches to the research using the methodological literature (showing the quality and validity of the research) and often do not explain how their approach addresses their research questions better than monotype or other mixed methods designs (Jick, 1979; Small, 2011).

Another criticism of MMR is that in mixed methods studies qualitative methods are often marginalised and postpositivist thinking is favoured (Creswell, 2011). In the present study, attention is given to both qualitative and quantitative methods, and integration is attempted at the stage of analysing the data (i.e. cross-over analysis) and interpretation of the results. The qualitative and quantitative analyses inform and complement each other.

I take Small's (2011) stance that the epistemological underpinning of the research techniques or methods cannot be ignored regardless of whether the research mainly employs a single method or a combination of methods. It is always important to provide the rationale for the methods used as well as the analytical underpinning of the methodology and the quality checks. How these issues are dealt with in the present research is discussed next, after a brief discussion on the use of MMR for SNA.

3.2 Mixed methods and social network analysis (SNA)

No 'best way' for conducting SNA has been identified in the literature, but the dominant approach has been to use structural network analysis (Edwards, 2010). Although qualitative data has been used in conducting structural network analysis, survey data is most commonly employed (Wasserman et al, 2005).

A reason for the increasing popularity of structural network analysis is the advantage of the technique for enhancing analyses of social networks: 1) structural network analysis takes a

temporal perspective to the analysis of networks, 2) it enables the visualisation and assessment of complexities (e.g. structural holes, cliques, resource flows), and 3) it emphasises actors' own models and conceptualisations of their relationships and social contexts (White and Johansen, 2005). The fact that SNA provides fine-grained details on individuals' relationships based on their own models and conceptualisations is a strength of the approach. The approach is thus useful for collecting and analysing 'real-life data' rather than imposing preconceived categories (e.g. categorising by ethnicity) on social networks, which is often done in sociology, as pointed out by Harrison C. White (see Azarian, 2005). This analytical underpinning of structural network analysis fits well with the constructivist grounded theory approach that the present research draws on, as well as ethnographic research. While much of the empirical literature employing structural network analysis has focused on one point in time, longitudinal analysis has become the gold standard as snapshots of the structure of a network is taken at different points in time (see Marsden, 2005). In analysing the network over time, longitudinal structural network analysis allows for an analysis of the dynamic nature of networks, which is a way of addressing the shortcoming presented by analysing snapshots of structure as if networks are static entities.

Another major shortcoming of structural network analysis is the neglect of the link between the network structure, institutions and agency (see Mische, 2011), which shape the network. Mathematical analysis techniques are inadequate for obtaining an in-depth understanding of the link between network structure and what actors actually do in networks. According to Edwards (2010: 2), who conducted a review of the use of mixed methods in the SNA literature, the increasing attention given to this 'new' perspective of networks as both transmission mechanisms and cultural forms, and as metaphor and method, has led to 'calls for the revival of qualitative approaches to social networks, not necessarily to supplant quantitative methods, but to complement them'. She identified four ways in which methods are mixed in the SNA literature:

- Using qualitative approaches to inform the use of quantitative network analysis
- Using quantitative approaches to inform the use of qualitative network analysis
- Integrating quantitative and qualitative methods of data collection and analysis (i.e. triangulation)
- Using qualitative methods of data collection and a combination of different types of data analysis

According to Edwards (2010), notable mixed methods research studies have integrated structural network analysis and analysis of ethnographic research, transforming the relational time-coded or longitudinal data obtained via ethnography into numerical data to be analysed with the use of structural analysis software (see for example, Mische, 2003; White and Johansen, 2005). White and Johansen (2005) provide a useful description of how SNA (specifically structural network analysis) and ethnography can benefit from each other. They argue that ethnographers are good at observing behaviour, identifying norms governing behaviour from observations, and identifying discrepancies between behaviour observed and verbally expressed norms. Traditional ethnography is thus not good at capturing dynamics of relations, how norms (and social groups) emerge out of interaction, and how they evolve. A network perspective focuses attention to the observation of interaction, which is important for the identification of the global properties of the network. Identifying the global properties of the network is essential for understanding the network as these properties 'alter the context of interactions and provide an understanding of feedbacks between dynamics (in behaviour) and structure' (White and Johansen, 2005: 8). Structural network analysis explores dynamics of relations and uncovers emergent processes and the effects of these on the social context, whereas traditional ethnography tends to focus more on behaviour produced by static norms (White and Johansen, 2005). Structural network analysis provides complementary and different perspectives to ethnography on social networks in the following ways: 1) it deepens the analysis through increasing the precision of the analysis of phenomenon ordinarily accessible to ethnographers (e.g. norms of marriage links); and 2) it allows for the 'discovery and exploration' of phenomenon not ordinarily accessible to ethnographers – specifically 'structural properties that emerge out of social interaction' and their effects on the context, and the range of possible options for interaction that are available to those in the network (White and Johansen, 2005: xxix).

Other qualitative methods of data collection used in the SNA literature include interviews, participant observation and participatory mapping, usually in creating ego-centred networks (i.e. recording ties of an individual and the ties to which s/he is connected) rather than whole networks (see Edwards, 2010). According to Edwards (2010), surveys are commonly used to collect relational data and the practice of conducting structural network analysis with data collected via qualitative methods is less conventional. Researchers utilising the latter approach tend to take the view that qualitative data collection methods yield relational data superior to the commonly used name-generator questionnaires (Edwards, 2010). In the present study, the

survey was found to yield superior data to the qualitative data collection methods for analysing the structure of the network. This finding indicates that the appropriateness of the data collection methods depends on the specifics of the research. The emphasis on flexibility and the appropriateness of research methods for addressing the research questions and the context are highlighted in the literature. For example, Mertens (2007) showed the importance of being able to collect different types of data to serve different purposes in social justice research. For example, qualitative methods allowed for a dialogue with community members, which is important in social justice research, whereas quantitative methods allowed for the collection of data deemed more credible by some stakeholders and scholars.

For mixed methods researchers, how to combine methods depends on the reasons for deciding to use a mixture of methods. The mixed methods literature provides several reasons for using MMR. The most common reasons are: to confirm and/or complement findings from each method (see Greene et al, 1989 in Onwuegbuzie et al, 2009; Small, 2011). Authors supporting the use of MMR to confirm findings argue that utilising more than one type of data, ideally in an iterative process, is advantageous as the strengths of the one method can compensate for the weaknesses of the other (Jones and Woolcock, 2009; Small, 2011). This research technique is sometimes referred to as triangulation (Denzin, 2012). An advantage of quantitative data collection methods is that data can be obtained from large numbers of people and can be easily aggregated (Jones and Woolcock, 2009). For example, quantitative methods (e.g. household surveys) can be used to obtain data on the presence or absence of relations among actors within social networks. It is very difficult to develop adequate quantitative measures for investigating the more difficult to get at tacit aspects of social networks and issues of process, local experience and causality (Burt, 2005; Jones and Woolcock, 2009; Knorringa and van Staveren, 2008; Nielsen, nd). Qualitative methods (typically interviews, focus groups and participant observation) are more suitable in this regard. Qualitative methods also 'allow unanticipated responses and issues' specific to the context, to arise (Jones and Woolcock, 2009).

In general, most of the studies in sociological journals during the 2000s have utilised MMR for the purpose of complementarity and some authors disagree with the use of mixed data collection methods for confirming findings as they claim that different methods inevitably produce different types of knowledge (see Small, 2011). Some studies have combined both types of methods for both functions: confirmation and complementarity (Small, 2011). In this

study, since the quantitative methods are utilised mainly to address the question of structure and the qualitative methods to address the question of dynamics and process, the methods are utilised to provide complementary findings for investigating both aspects of networks in a single study. This design is important for exploring networks as sense-making systems.

The design of the present research is thus multi-stage, with the qualitative data (interview and focus group transcripts, and field notes) informing the survey questions. In this way, the survey questions were more focussed on what was relevant to the networks and actual lists of network members generated from the qualitative data could be included in the questionnaire. The rest of the chapter focuses specifically on the methodology employed in the present research study, starting with a discussion on the analytical approach and logic of the research.

3.3 Mixed methods social network analysis (SNA) in the present study

3.3.1 Epistemological underpinning

In the present research both qualitative and quantitative methods are equally important for addressing the research questions. The analytical approach guiding the research is a network-institutional perspective that conceptualises networks as socially-constructed fields (discussed in detail in the previous chapter)¹¹. The research is thus guided by an emphasis on the meanings people attach to their own actions with the meanings thought to be socially constructed and thus not time or context free (see Onwuegbuzie et al's [2009] description of constructionist approaches). With this network perspective, actors' human agency is emphasised. Due to the time and context-specific nature of the research, internal generalisations and analytical generalisations are emphasised. Constructionists disagree with the use of inferential statistics emphasising external generalisation (Onwuegbuzie et al, 2009). Constructionists, like most other qualitative researchers, often utilise descriptive statistics to enhance their research by providing more detailed information and improving the credibility of the research (see Small, 2011). In this way, the quantitative analysis contributes to the internal reliability (internal generalisations) of the research. The quantitative methods utilised in the present research, including structural network analysis and descriptive statistics, serve to inform internal and analytical generalisations (i.e. how the findings of the cases researched

¹¹ The analytical underpinning is thus an interpretivist rather postpositivist research approach. It is important to note that I agree with the assertion that the epistemological underpinning and logics to which methods are tied should not be ignored as these assumptions inform the knowledge produced and interpretation of the findings (see Small, 2011). As shown below, I have conducted the necessary quality checks for validity and reliability relevant to the nature of the research.

fit theoretical constructs) rather than external generalisations. This strategy is commonly utilised in qualitative research and is in keeping with grounded theory approaches (Onwuegbuzie et al, 2009), and it is typical in network analysis research (Edwards, 2010).

3.3.2 Mixed methods design

Coherent frameworks or typologies of MMR do not exist (Onwuegbuzie et al, 2007; Small, 2011). Some attempts have, however, been made to identify trends in the use of MMR in the literature (e.g. Small, 2011) and to provide some structure and guidelines for mixed methods researchers (e.g. Onwuegbuzie et al, 2007). According to Onwuegbuzie et al (2007: 118), 'before conducting an analysis, a researcher explicitly or implicitly makes the following six decisions':

1. The number of data types that will be analysed – monotype (one type of data, for example, qualitative data) or multi-type data (both types of data, that is, qualitative and quantitative data);
2. The number of data analysis types – monoanalysis (one type of data and one class of analysis) or multi-analysis (one or more types of data, both classes of data analysis);
3. The analysis emphasis – case-oriented analyses (i.e. analyses that focus primarily or exclusively on selected case(s)), variable-oriented analyses (i.e. identifying relationships among variables) and/or process/experience-oriented analyses (i.e. evaluating processes or experiences pertaining to one or more cases within a specific context over time);
4. Whether non-crossover or cross-over (i.e. analysing qualitative data with quantitative analysis techniques and vice versa) mixed analysis will be used;
5. Whether the analysis will be carried out concurrently (i.e. results obtained from one phase of the analysis does not inform the next phase) or sequentially (i.e. results obtained from one phase of the analysis informs the next phase)

The present research utilises multi-type data (from survey, interviews, participant observation and focus groups) and multi-analysis (including structural analysis, descriptive statistics and thematic coding). The analysis is case-oriented as it focuses primarily on one development network organisation, and process-oriented as the focus is on the dynamics of relations as well as the process components of the networks.

Since the present research focuses on one development network organisation, more than one type of data is collected from the same actors (nested data) (Lieberman, 2005 in Small, 2011: 69). According to Small (2011), this type of design is popular in the sociological literature, with most utilising a combination of surveys and interviews with the interviewees constituting a sub-sample of the survey participants in order to obtain more in-depth data. Interview data is also often used to contextualise the survey data.

In the present study, it was not feasible to interview each actor involved in the development network organisation (DNO) as the actors were based in four different countries. They were also very busy and travelled a lot, and thus it was not always possible to interview actors either face-to-face or telephonically. The (internal) reliability of the structural network analysis, however, depends on relational data from the whole network (see Marsden, 2005). An online survey was thus employed to collect data for the structural network analysis as this method allowed network members to provide their relational data regardless of where they were based and respond to the survey in their own time.

The present research study could potentially have relied on cross-over analysis, utilising the quantitative methods to analyse the qualitative data rather than using survey data. The data on the frequency of interaction among the network members obtained via the interviews and ethnographic research was used to map the structure of the network during the first two stages of the research. However, employing a survey to obtain the data on existence and frequency of ties among the actors and their use of ICTs was found to be necessary in order to reach more of the actors involved than was feasible through the qualitative methods. Since the online survey included more of the network members than the interviews and ethnography, the survey produced the most reliable data on interaction (see the discussion on the ethical considerations of social network analysis later in this chapter). The analysis of the structure of the network discussed in this thesis thus draws on the online survey data only. The data on interaction collected during the first two stages of the research informed the development of the online survey questionnaire.

In order to increase the validity of the survey, data obtained via the interviews and ethnographic research was utilised to inform the survey questions. A sequential mixed methods design was thus employed as opposed to a concurrent design. Sequential designs are interactive in nature and can be iterative as findings from one set of data inform the other. An

advantage of sequential designs is the opportunity to ‘resolve specific questions that emerge in the process of data collection with additional data collection’ (Small, 2011: 68). With concurrent designs, data collection takes place concurrently. Concurrent designs are often utilised when sequential designs are found to be inappropriate, for example when conducting data collection sequentially is impractical due to time constraints (Small, 2011). Since MMR is motivated by using the best methods for addressing the research question, the research design of mixed methods research is often not chosen a priori as with monotype approaches, and flexibility is allowed in the field. Such an approach is thus appropriate for use with grounded theory.

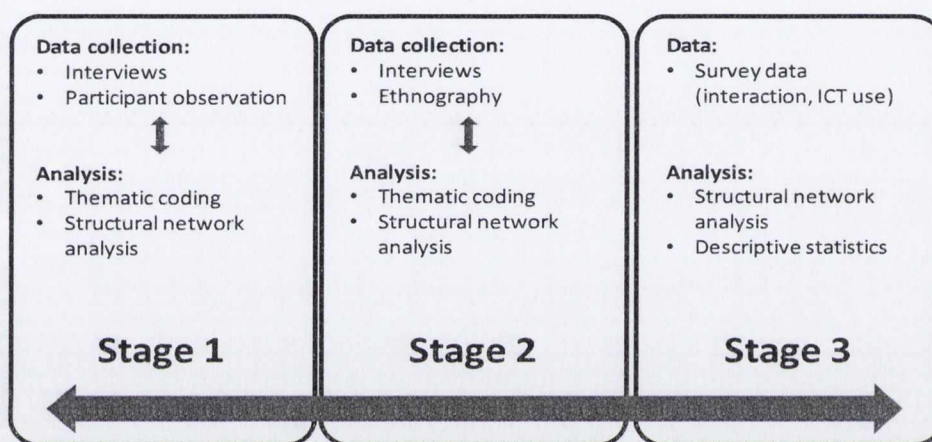


Figure 6 Sequential design of the present mixed methods research study

The remainder of the chapter includes a detailed description of the methods employed and procedure followed in the present research. For the sake of clarity, the methods and procedures are described by the stage of the research.

3.4 Stage 1: Getting to know the field, selecting a case study

The main aim of the first stage of the research was to gain as much information on the DevAid Programme of Collaboration (PCHE), that is, the aid-funded programme under which the MozOptom DNO is funded. A total of eight development projects were funded under this programme (see Chapter 1 for a detailed description of the programme). Understanding the projects – their diverse aims, formal organisational structures, etc. – using desktop research alone was difficult. The information made available to the public via the internet depended on how often the projects updated the information (e.g. partner institutions changed) and how much information they shared.

A major problem I encountered at the very beginning was getting to understand the structure of the programme, that is, how the programme was administered and the formal lines of reporting. Information provided on DevAid and the HEA's websites was not clear. I came across the thesis of a Masters student, who had researched the programme as part of her studies, and found that she too had experienced difficulty getting to grips with how the programme was organised (see Breen, 2008). In order to get to grips with the formal organisation of the programme, I developed an organogram and list of partner institutions for each of the projects based on the information obtained via the project websites. I printed this out and took it with to the interviews with the key contacts. I found it to be a useful visual tool for discussing the organisation of the programme and projects. I asked the interviewees to assist in adapting the organogram and lists so that I could develop a more accurate visual diagram and understanding of the organisation of the programme and the individual projects (see Chapter 1).

3.4.1 Data collection

During the first stage of the research the data collection methods thus included the collection of secondary data available through the websites of DevAid, the HEA and the projects, and primary data collected via semi-structured depth interviews. The interviews at this stage of the research were conducted during two periods, May to June 2010 and September to December 2010. Interviewing key people in the programme was thought to be the best way to gain access to this programme – that is, access as in gaining an understanding of the programme and developing rapport with the key contacts, which would be essential for the next stage of the research. The third method of data collection was attending events held by the projects (workshops, public seminars and conferences).

By the end of Stage 1, I had conducted a total of 33 interviews with 35 interviewees (two interviews included two people). The duration of the interviews ranged from 26 minutes to over two hours, with most interviews lasting one hour. I also attended 11 events organised by DevAid and/or the projects, including conferences, meetings, workshops/seminars, courses and public social events.

In order to get a good sense of the aims of the projects, how they were organised and project activities, I interviewed individuals involved in the projects at different levels (individuals holding different positions in the project). Interviewees thus included individuals identified on

the project's websites as the key contact(s) for the project (e.g. project co-ordinators, project managers, Principal Investigators), steering/executive committee members, PhD supervisors, PhD students and project administrators/secretaries. Each project had a distinct organisational structure.

Since this stage of the research was more exploratory, the interviews were generally arranged using a snowballing sampling procedure. I usually firstly contacted the key contact(s) of the project via e-mail to request an interview, providing a brief summary of the research and purpose of the interview. Before starting each interview I provided a brief summary of the research and requested permission to (audio) record the interview. Only two interviewees did not consent to the interview being recorded. If possible, a face-to-face meeting was arranged. Only four interviews were conducted telephonically. I also liaised with some interviewees via e-mail (in addition to the interviews) to request more information or clarity on certain issues. I asked each interviewee to put me in contact with or suggest other individuals involved in the project/programme who they thought would be a useful resource for getting to know the projects/programme. The interviewees did not always recommend other contacts. The number of interviews conducted with each project depended on the extent to which I was allowed access into the 'life of the project/programme' and the openness of the project members to be interviewed, which was also affected by their busy schedules as some project members pointed out.

The interviews were open-ended. I usually started with an open-ended question, such as: 'Can you tell me about the project/programme?', 'Can you tell me about your experience of being part of the project/programme?', or 'Can you tell me about how you became involved in the project/programme?' I would then allow the interviewee to direct the rest of the interview. The length of the interviews also depended on the time made available by the interviewee rather than by me.

I would ask probing questions based on the storyline the interviewee provided and what I had learnt in previous interviews (without revealing my sources). I had in mind a set of topics to be covered in each interview (for the interviews conducted at Stages 1 and 2):

- The interviewees' perception of the project (aims, main activities, etc.)
- Background to the interviewee's involvement in the project (gives insight into how the network was formed and their motivations for being part of the network)

- The interviewees' experiences of being part of the project (positive experiences and challenges faced as a project member)
- The interviewees' relations with other project members (the types of relations, frequency of interaction)
- The modes of communication they utilised in communicating with others with regard to project activities
- The interviewees' relations with individuals involved in other projects funded under the DevAid programme (gives insight into the social ties between the projects)

I would ask questions related to these issues if the interviewee did not discuss them in narrating their experience of participating in the project/programme. The interview schedules were adapted according to the role of the interviewee in the project/programme (e.g. Principal Investigator, PhD student) as s/he would have access to different knowledge with regard to the history of the programme/project and programme/project activities. The interview schedule for each interview was also informed by previous interviews as the research became more focused with the data collection, which is in accordance with a grounded theory approach (Glaser and Strauss 1967, reprinted in 2008).

3.5 Stage 2: Fieldwork

After transcribing most of the interviews conducted during the first stage of the research, one of the projects funded under the DevAid PCHE was selected for further research as a case study. A case study method is useful for the purposes of the research as it is specifically designed to analyse phenomenon in-depth, thus providing rich detail, and for understanding context and process (Flyvberg, 2008). Case study methods are typically used in grounded theory (Charmaz, 2011; Denscombe, 2010; Glaser and Strauss, 1967 reprinted in 2008). The criteria for selecting a case for further study were that the development project had to:

- have the development of STI capacity as a main goal,
- be implemented in one low-income country in sub-Saharan Africa with their main project activities taking place in the African country (in order to ensure feasibility of the research as part of a three-year PhD study), and
- have indicated, in the interviews during Stage 1 of the research, openness to me researching the project.

The MozOptom DNO was found to best fit the criteria and was thus selected for further study. The initial plan was to conduct at least one comparative case with one of the two other projects including a partner institution in Mozambique, where the MozOptom DNO was implemented. I found this to be unfeasible during Stage 2 of the research as the other projects included 'partner institutions' in several other countries in sub-Saharan Africa as well. Researching any one of the two projects in-depth was thus not feasible due to constraints of time and funding. I did, however, manage to interview a key contact, of the other projects, who was based in the capital city of Mozambique. This provided me with the opportunity to learn more about the context, including the country context, context of academia and development in Mozambique, and the social context of other projects funded under the aid programme in which the MozOptom DNO is embedded.

A major challenge of the research was that the MozOptom DNO, like most 'North-South' development projects, consisted of individuals based at different institutions in four countries.

3.5.1 Multiple research sites

The challenge of multiple research sites is typical of development network organisations (see Bebbington and Kothari, 2006). Having multiple research sites was particularly challenging in the present research study as it was necessary to gain in-depth insight into interaction among network members based at different institutions. Gaining insight into the wider organisational and country contexts was also important for understanding how the network operates and the factors shaping the structure and dynamics of relations. The methods of data collection thus had to facilitate research on multiple sites, but also had to be feasible for a three-year PhD study. The methods that were found to be most appropriate for gaining in-depth insight into the life of the project while keeping within the limits of the PhD are: ethnographic research on project activities in the country in which the project was implemented, Mozambique, and semi-structured depth interviews with individuals involved in the core activities of the project but were based at one of the core institutions outside of Mozambique. I conducted the interviews with the individuals at their offices and thus had the opportunity to visit the core institutions involved in the network organisation, including institutions in the European country and the other Southern African country. I thus accessed all sites, except for one European university which plays a peripheral role in the project and thus is not involved in the day-to-day running of the project. This selection is in accordance with Fligstein and McAdam's (2012) guidelines for identifying members of strategic action fields. I spent three

days at the offices of OptomNGO, getting to know the organisation and conducting interviews with staff.

3.5.2 Learning through experiencing and participant observation

'(E)thnography offers rich data and grounding for network analysis' (White and Johansen, 2005: 3). It is ideally suited for collecting data on and understanding interaction (Collins, 2005 in Timmermans and Tavory, 2007). For the purposes of the research, it was important to obtain 'rich data' based on 'thick description' (Geertz, 1973) on the relations between the network members specifically, and the culture of the network organisation, generally, as well as the social networks and wider cultural context in which the MozOptom DNO was embedded. While interview data can serve this purpose, interview data is limited in that it focuses on the overt statements of actors. According to Charmaz (2011), actors may not be aware of certain processes shaping their lives and sometimes the information actors choose to share may be influenced by their attempts at impression management. Their overt statements may thus not provide data necessary for understanding social structure and processes. I agree with White and Johansen's (2005: xxvi) statement that, 'The study of behaviour is complementary to the study of verbal expressions'. Besides being able to observe behaviour, first-hand, and events as they unfold, the main advantage of ethnographic research for the purposes of the present study was that it enabled me, as the researcher, to experience some of what the project members experienced entering and living in the context as a foreigner. The experience also helped me get the 'feel' of the project, what happens on a daily basis, the routine activities and the challenges – which is an advantage of ethnographic research (Timmermans and Tavory, 2007). This experiential side of the research informed my understanding of the project and thus the analysis.

The ethnographic research was conducted over four months, during the period May to December 2011, in Mozambique. The university, where the optometry training programme was being established, was closed for holiday during June and July. Most of the staff at the university and individuals involved in the project were away during that period for holiday and/or attending meetings and conferences outside of the country. I thus conducted the first part of the ethnography during May, left Mozambique in June and returned at the end of July.

During the first part of the ethnographic research, I experienced great difficulty finding accommodation for the (approximately) three weeks I had planned to spend in Tizangara

before the university closed. The places offering accommodation with working basic facilities (e.g. working toilet, running water in the shower, etc.) were either too expensive or fully booked, and the available accommodation that I could afford did not have the basic facilities and were not well-kept. The project manager then kindly agreed to let me stay in the spare room at his house for a nominal fee. During this period, I was closest to the project members based in Tizangara (in terms of physical proximity and immersion in their lives).

I spent each day shadowing one of my key contacts in the project: the project manager, course co-ordinator and a deputy director at UniUS. I usually contacted the project members via sms or e-mail to request permission to shadow them that day and find out what their plans were for the day. I got to learn the schedule of my key contacts and organised the week accordingly. For example, I knew that the course co-ordinator had practical classes with the sixth semester students on a Tuesday, which involved the students conducting eye tests with members of the community (mainly the students' family members and friends). Since this provided me with the opportunity to observe interaction between the project and the local community, I arranged to shadow the course co-ordinator on these days. Another opportunity to observe interaction between the project and the local community was on Wednesdays when the students, under the supervision of the lecturers, visited families in the community near the university as part of the 'One Student One Family Programme' at the university.

I tagged along with the optometry lecturers supervising the students. A typical day shadowing the course co-ordinator and/or lecturers started with me meeting them in front of their apartment building where the shuttle service provided by the university collected them and other staff at the university. The university provided housing for all of the expatriate lecturers and the lecturers usually shared apartments. A few of the lecturers lived in the building where the optometry staff lived. I thus usually met them all in front of their building around 7am and travelled with them to the university. The shuttle service ran at set times: 7am (from the city to the university), 12pm (from the university to the city for lunch), 1:30pm (from the city to the university) and 4pm (from the university to the city). Once we got to the university, I basically followed the course co-ordinator and/or lecturers around, depending on who I was shadowing that day, and sat in on the classes that they taught. During the lunch times, they often invited me to join them for lunch at the course co-ordinator's apartment. I had lunch with them more often during the first period of the research than the second, as the dynamic changed when the temporary lecturers left and new lecturers joined the teaching team. The

conversations were usually about their teaching activities or other duties at the university and about their experiences of living in Tizangara (e.g. cultural beliefs about spirit possession that the students sometimes used as an excuse for not performing well). They also talked about arranging leisure activities at the beach, for example. The lecturers who spoke English fluently would converse with each other in English when I was present. All of the project members, including those who were not very fluent in English, spoke English when the project manager was present.

When shadowing the project manager, I would usually sit on the couch in the living room writing in a notebook, reading or working on my laptop while he worked at his dining-room table (it was an open-plan lounge and dining room). Although he had a spare room at his home that was officially the 'project office' and technically OptomNGO's country office in Mozambique, he preferred working on his laptop in the dining room. The spare room included a desk, printer and stationery. The project manager often conducted meetings over the telephone (mainly on his mobile) and internet (using Skype). When he had these meetings, he would go into the office and close the door. I also shadowed him when he did certain duties outside of the office (e.g. making travel arrangements at an airline's office). He did not own a car so we usually walked to different places around the city. We would often engage in conversation about the project during these periods of time. I took the opportunity to ask questions about aspects of the project or context I did not fully understand.

When shadowing a deputy director at the university (i.e. UniUS), I typically took the university shuttle to his office at the new university campus. He generally arrived at work around 8am. I would then spend most of the day sitting at a table in his office working on my laptop or reading a document and observing. We would talk while he sat at his desk working on his laptop. He usually listened to BBC news on a radio he kept on the desk. In the time I spent there, he would describe his experiences of working and living in Tizangara and his perceptions of aid agencies, NGOs and development. I often asked him to explain local cultural or social practices to me. I also gained insight into cultural practices of different social groups in Mozambique. I often drove with him back to the city at the end of the day as he too lived in the city. This trip usually included a stop at a shop along the way to buy groceries. On one occasion, I was invited for lunch at his family home.

I was thus fortunate to have been warmly welcomed into the daily lives and homes of my three key contacts as well as some of the other optometry lecturers. Other spaces that were important for the research included the social events held by the staff and students in the optometry department (e.g. World Sight Day celebrations and farewell parties for the lectures) and events held by the expats in the city (e.g. charity dinners). Most of the expats knew each other and spent weekends at the beach together. At the events arranged by the expats, the lecturers at UniUS made up the largest group (others in attendance included NGO workers and students conducting research. In attending these events, I could access another part of the expat project members' social lives and networks. While in Tizangara, I attended a total of 16 events. All of the individuals I interacted with on a regular basis were well-aware of the research and often suggested individuals who they thought would provide information useful for the research and also provided information that they thought was important for the research.

Although I only conducted the ethnographic research over four months, when I reached the start of the fourth month in the field I felt that I was no longer learning anything new about the project activities in Tizangara and the interactions among those involved in the project. It felt as though things had settled. It was also nearing the end of the year before the long summer holidays, so the project members were preoccupied with tying up loose ends before going on holiday. The key project members based in Tizangara also began to ask what I was still doing in the field and what I still wanted to find out. Three of the members suggested I return the following year as they were making some changes to the teaching schedule (e.g. the 'One Student One Family Programme' was being improved) and a team from the university would be going into secondary schools around the Northern region as part of the university's strategy for recruiting students. The latter was supposed to have taken place towards the end of the year, but was postponed. It seemed as though one cycle of the project was finishing and another cycle in the life of the project would begin the following year. Some of the key members involved in the project left the following year as they did not choose to renew their contracts. Ideally, research on the social networks of the project would have explored the dynamics of the network through the life cycles of the project. However, it was only feasible to cover the life of the project until the third year. The research does, however, cover the processes by which the network emerged as well as major (including a major crisis period) and incremental transformations and stabilisation of the network.

3.5.3 Gaining access

My strategy for gaining access to the research sites was through the project co-ordinator who I interviewed during the first stage of the research. I sent the project co-ordinator an e-mail indicating my interest in conducting further research on the project as part of my PhD research. I informed her that I had wanted to talk to as many individuals involved in the project as possible, including visits to each of the core institutions. I also indicated that I would like to shadow the key individuals involved in project activities in Tizangara as part of an ethnographic research approach. She then put me in contact with the key project members at the different institutions by sending them an e-mail introducing me to the group and providing the brief summary of the research I had sent her in an e-mail. I was copied in on this e-mail. I then received e-mail responses from some of the key contacts indicating their willingness to participate in the research and offering support. Management at UniUS was not included in the communication at that stage. The project co-ordinator and project manager then advised on how to approach gaining access to the university in Tizangara in order to conduct research at the university as I had indicated in my e-mail that the research would include interviews with staff, focus group discussions with the students, and observing lectures and meetings and events. They advised me to compile a formal letter addressed to the Rector of the university, requesting permission to conduct research at the university. The project co-ordinator then forwarded the letter to the Rector via e-mail, copying me in on the communication. The Rector responded via e-mail that I was welcome to conduct the research. He copied in some of the staff at the university (e.g. a Director and Deputy Director, administrative staff). He also put me in contact with a member of staff at the level of management at the university who he said would act as my key contact at the university. I had expected a formal procedure for obtaining permission to conduct the research. Instead, the tone of the Rector's e-mail responses was very informal. I was not requested to complete any further documentation. All of the communication via e-mail was in English.

Considering that I did not speak Portuguese – Mozambique is a mainly Portuguese-speaking country – and the fact that I could only spend a few months conducting the ethnographic research rather than the one to two year period that is the norm for traditional ethnography, I had initially planned to focus on the perspective of the foreigners entering the field specifically for the project. All of the individuals involved in the project who were based in Tizangara, except for the management staff at UniUS, were foreigners recruited for the project. One of the requirements was proficiency in English as the project members at the OptomNGO and

NEuroIT did not speak Portuguese. I felt that I could also best relate to the experiences of these individuals as an outsider of the context intending to spend a defined period of time in the context. However, on my fourth day in Tizangara I met the individual the Rector 'assigned to me' as my key contact. He was a deputy director at the university and spoke English fluently as he had spent a few years in an English-speaking country prior to returning to Mozambique. He introduced me to staff and assisted in arranging interviews with staff at the level of management at the university. During my first few meetings with him I realised that the time I spent shadowing him provided important insight into 1) one of the organisations involved in the implementation of the project, and 2) the life of the project from the perspective of management at the university, which is insight that I would not have gained through only shadowing the foreigners recruited for the project. This is important considering the 'scarcity of evidence from African voices' in the literature on 'North-South' development projects (see Marjanovic et al, 2012). Since language was not an obstacle, this actor became my third key contact in Tizangara.

Hence, I had three key contacts in Tizangara who facilitated my access to three different domains. Through the project manager, I was able to access the domain of the project where the logistics of the network organisation were organised (e.g. financial management, travel arrangements, etc.). Through the course co-ordinator, I gained access to the different domains where the optometry course activities (and related activities), specifically, took place. The deputy director also facilitated my access to the university, specifically the management of the university.

While some of the project members openly welcomed me into the project and facilitated my access to the life of the project, access was also blocked in some ways. A few weeks after I returned to the field for the second time, I was informed that some of the project members had raised concern about me spending such a long period of time in Tizangara researching the project without having signed a confidentiality agreement that would provide them with some assurance that sensitive information would not be leaked, and that would give them some control over the research. The other PhD students researching the project were bound by such an agreement and were supervised by two of the project members. Although agreeing to sign the agreement would have facilitated my access to the project, it would also have compromised my independence as a researcher and potentially the confidentiality of the data. I was also informed of another concern about my research overlapping with that of another

PhD student, who was conducting a formal evaluation of the project. The Principal Investigator then requested a meeting with my PhD supervisor and me to discuss the issue. The agreement reached at this meeting was that I could continue my research without signing any agreements with the project. The disadvantage of not signing the agreement, as I had begun to experience, was that I was only allowed access to documents and project events that were open to individuals beyond the group responsible for the implementation of the project. I was thus denied access to the formal meetings among project members and project documentation. The lack of access did not, however, hinder my research much as the project members were still open to me interviewing and shadowing them as they carried out their duties. I was also invited to participate in the social events they organised as part of the project (e.g. farewell party for the lecturers) and outside of the project (e.g. charity dinners organised by the expatriates). Also, much of the interactions among project members in Tizangara were informal (e.g. discussions during lunch), which I was still able to access. I did, however, notice a change after the issue of confidentiality was raised. The project members (project manager and course co-ordinator mainly) would sometimes go into another room to conduct short meetings when I was present, which did not happen before. Noticing this change, I explicitly asked one of the key project members about how the fact that the research was not bound by a confidentiality agreement would impact on my fieldwork. The response I received was that each of the project members was free to participate in the research if they wished to do so.

During the ethnography, I conducted formal semi-structured depth interviews with the project members and other stakeholders, and focus group discussions with the students receiving the training.

3.5.4 Interviews

During this stage of the research, I followed the same procedure for the interviews conducted during the first stage of the research (described above). I also asked the interviewees similar questions (see Appendix 1). I conducted a total of 22 formal semi-structured depth interviews with 24 interviewees and four focus group discussions. 'Formal interviews' refers to interviews that I formally requested. All of the formal interviews were (audio) recorded, except when the interviewee did not consent to the interview being recorded and the one telephonic interview. The average duration of the interviews was approximately one hour. The interviewees included individuals involved in the MozOptom DNO at different levels (see Table

1 below) and individuals who could provide additional insight into the context where the project was implemented – namely a non-optometry student at the university who came from a prominent family in the community, a project manager of another high profile aid programme operating in the region, other staff at UniUS and the OptomNGO, a key person involved in the provision of public eye care services in the region, and a Director in the Department of Science and Technology in Mozambique.

In a relatively small network like the MozOptom DNO it is difficult to completely disguise the identity of the participants without hindering the analyses. In an attempt to protect the identities of the participants, the participants were divided into groups according to the level of their involvement in project activities. These categories were utilised in discussing the findings, rather than using the participant’s actual designation in the network organisation. The different groups of project members referred to in the analyses chapter are shown in Table 1.

Level of involvement/team (Categories)	Designation in the MozOptom DNO
High-level decision-makers (DNO Executive Management)	Principal Investigator (1) Director of OptomNGO (1) Rector of the university (1)
Day-to-day management (DNO Core Management)	Network Co-ordinator (1) Network Manager (1) Management team members at OptomNGO (1) Training Co-ordinator (1)
University management (UniUS Management)	Rector of the university (1) Directors and Deputy Directors (Pedagogica, Information Technology, Academic Services) (4) Deputy Dean (Faculty of Health Sciences) (1)
Optometry Lecturer	Lecturers (Department of Optometry) (5) Training Co-ordinator (1)
Staff at OptomNGO (OptomNGO Staff)	Research team, Global Resource Management, Human Resources, Social entrepreneurship (4)
PhD Students	PhD Students (4)

Table 1 Categories assigned to DNO members in the analyses

Note: The number of individuals interviewed at each level is indicated in parentheses (some individuals were interviewed more than once, which is characteristic of ethnographic

research). The roles of some individuals overlap (e.g. DNO Core Management and PhD Student).

The categories in Table 1 are related to the sub-groups or teams into which the DNO is organised, but does not reflect the actual structure. The list of categories was created specifically as a way to disguise the identities in reporting the findings of the research. In some cases, I utilised the term 'key person(s)' in referring to individuals involved in the first three categories (in Table 1) when the information or finding reported may be considered sensitive. The description of the social skill of strategic actors was an exception as it was crucial to link the strategies described to the designation of the individual. This information was not, however, found to have a negative or unfavourable reflection on the individual discussed.

3.5.5 Focus group discussions

In order to gain the perspectives of the optometry students as important stakeholders of the project, I conducted four focus group discussions with 18 of the 57 students (average of five per group). The focus groups were arranged through the course co-ordinator. I informed her that I required approximately six students per group. She then informed me of the times that the students were available and arranged for a room, where the students conducted their practical sessions, to be used for the focus groups. I arranged the chairs in a circle at the front of the room in order to create a set-up more conducive for discussion among the students. I also offered some snacks to the students during the sessions.

Almost all of the students arrived at each of the sessions. They informed me that they thought their attendance was mandatory. The course co-ordinator also informed me that she felt she had to request that all students participate as it was likely that no one would turn up if they were told that participation was voluntary. Before the sessions started, I informed the students that their participation was completely voluntary and that a maximum of eight students per session was preferable. The students who did not wish to participate then left. At the start of each session, I requested permission to record the session, stating that the audio recording will only be for my records and that the discussions would be kept confidential and any reports produced would not reveal their identities. I then provided a brief summary of the research and the purpose of the focus group discussion.

Considering that the first language of most of the students was Portuguese, it was necessary to hire a Portuguese-English translator to assist with the focus groups. The translator hired was recommended by a key project member as he had been hired a few times for assisting with the translations on the project. The students had also met him before as he had translated focus group discussions conducted as part of the research of another PhD student. The translator was a registered Portuguese-English translator and was reported to be reliable. Each of the focus group sessions also included at least two students who were proficient in English. Most of the students could only speak English at a very basic level and we struggled to converse without a translator. When observing and participating in the social events organised by the class (and in the last focus group), I managed to converse well with the students who were proficient in English. With some of the other students, we managed to understand each other when the students spoke to me in a mixture of Portuguese and English. I attended Portuguese classes before entering the field for the second time, in order to have a basic grasp of the language for daily communication (e.g. taking a taxi, shopping at the local vegetable market, etc.). My lack of proficiency in Portuguese was not, however, a major hindrance for achieving the main objectives of the research.

I firstly conducted three focus groups with the students, one per semester group. The main aim of the focus group discussions was to learn about their experiences of being a student in the optometry course and being a student at UniUS, in general, – including their positive and negative experiences and the challenges they experienced –, their relationships with project members (i.e. teaching staff, network manager and other members of the project) and their future career plans. The focus group discussion guide is included in Appendix 1. These focus group discussions were conducted on the same day in October 2011. The fourth focus group was conducted in December 2011 as a follow-up to the other focus group discussions. The purpose of the focus group was to obtain clarity and more information on issues that the students raised in the previous sessions, and to find out about their relations with the new lecturers. The fourth focus group discussion thus included a mixture of students from each of the semester groups.

During the focus groups, the translator translated my questions and comments into Portuguese and translated the students' questions and comments into English. A few of the students were proficient in English and thus understood me and sometimes responded in

English. The discussions were translated verbatim soon after the sessions were conducted. I transcribed the English translations for the analysis.

The course co-ordinator requested a summary of the first set of focus group discussions. I prepared a brief report on the discussions, including aggregated findings in order to protect the identities of the students, and sent the reports to the project members indicating that any feedback was welcome.

3.5.6 Methods for analysing the qualitative data collected at Stages 1 and 2

Working within a grounded theory approach, the analysis of the data began from the start of the research. Simultaneous data collection and analysis is a core strategy of grounded theory approaches as the one streamlines and informs the other, following an iterative process (Bryant and Charmaz, 2007; Charmaz, 2011). During each interview, I took notes on key issues that arose during the interview. After each interview, I typed up these notes, and identified any research questions that came up. I also typed up notes on my initial thoughts of the interviewees and the physical setting of the interviews (usually the office of the interviewee, and sometimes a coffee shop or restaurant, depending on where the interviewee felt most comfortable). As part of the process of analysis, I transcribed each of the interviews verbatim and noted any key issues and/or questions that arose during the interviews. I started transcribing the interviews from the first year of the project (Stage 1) and also transcribed the interviews while in the field during Stage 2.

In conducting the ethnography, I carried a notebook (or paper) or my laptop with me and recorded my observations of interactions, the conversations between actors and between the actors and myself, the routine of the day, and my perceptions and experiences of the context. I typed up handwritten notes whenever I had the chance, which was mostly at night and on weekends. I read through the field notes a few times while conducting the ethnography and noted key issues and questions that emerged. These notes were utilised to focus the research and develop categories to be analysed and explored further. The advantage of using a grounded theory approach in analysing data gathered through ethnographic research methods is that the approach requires the researcher to focus the research and think conceptually early on in the research rather than focus mainly on thick description (Timmermans and Tavory, 2007). According to Timmermans and Tavory (2007), researchers taking a grounded theory approach to ethnographic research should, however, be careful of

over-emphasising the development of theoretical categories and engaging in mindless coding and memo-writing, thus neglecting that which is truly captivating in the field and the in-depth knowledge gained.

In order to maintain closeness to the data through persistent interaction with the data, I transcribed the interviews myself and manually coded and analysed the data (as opposed to using computer-assisted qualitative analysis). I coded three interviews with key project members, line-by-line, keeping close to the language of the interviewees. I compared the codes across the three interviews and then recoded the interviews to identify analytical categories, comparing these with the categories I had identified previously. I then coded the other interviews and the field notes with the aim of confirming and expanding the categories, and looking out for contradictory findings and additional findings (i.e. identifying other categories). This is referred to as theoretical sampling (Charmaz, 2011).

Bryant and Charmaz (2007), among others, caution against the use of software programmes for analysing data (using grounded theory) as this creates distance between the data and the researcher and reduces the control that the researcher has over the analysis. I found that coding and analysing the data manually required me to read and reread the data several times, checking for confirmation and contradictions to the categories that emerged. This strategy was useful for identifying additional categories.

Since the interviews also yielded information about the relations that each actor had in the network, I transformed this data into numerical data that could be used to develop a dataset on interaction among the network members. Once the dataset was complete, I conducted structural network analysis using the software programme, Pajek. The details of the structural network analyses conducted as part of the research is described in greater detail later (see Stage 3 of the research).

The data collected at Stages 1 and 2 informed the survey conducted during the third stage of the research. The list of project members included in the datasets developed from data collected during the first two years of the research (i.e. Stages 1 and 2) was utilised in the questionnaire.

3.6 Stage 3: Survey and structural network analysis

Since the research benefitted from multiple types of data, I was able to access multiple types of data for the structural network analysis (SNA): 1) data obtained via the interviews and participant observation conducted during the periods May to December 2010 and May to December 2011, and 2) data obtained via a survey conducted during the period May to July 2012.

In each case the participants were asked to indicate how often they interact with other individuals involved in the project/programme. Interaction included the more direct forms of communication, that is, face-to-face and telephonic communication (including teleconferences and internet calls), and indirect forms of communication (e.g. e-mails), considering that project members were located across several different organisations based in several different countries. Drawing on Granovetter (1983), for the structural network analysis, frequency of interaction was used as a proxy for the quality of relations among network members, based on the premise that stronger ties are associated with more frequent interaction (using cut-off-points). This data could be confirmed and complemented by the qualitative data.

Although it was possible to conduct structural network analysis at three points in time, the temporal analysis was not included in the thesis. The data on interaction collected at the different stages of the research were collected using different methods of data collection and different 'informants'. The temporal analysis may thus be influenced by mode effects, and would need to include an in-depth analysis of the differences between the data yielded through the different modes of data collection. Such an analysis was beyond the scope of this thesis. I thus decided to include only the analysis of the most reliable data (i.e. the survey data).

3.6.1 Data obtained during Stages 1 and 2 (qualitative data)

Since the interviews also yielded information about the relations that each actor had in the network – as each interviewee was asked with whom they communicated with regard to project activities and (on average) how often this interaction took place – it was possible to transform the data obtained via the interviews into numerical data. This data was thus mainly on ego-networks. I did, however, also ask the key contacts of the projects/programme to indicate the formal lines of reporting in the project/programme, and the individuals involved

in the different teams in the programme/project and how often they interacted. This method of data collection for the structural network analysis – that is, relying on a key contact in a network for obtaining data on relations in the network (e.g. a line manager in a company reporting on relations in his/her department) – is not uncommon in the SNA literature (see Burt, 2005; Marsden, 2005). The literature reports different levels of reliability for structural network analysis based on this type of data, but data obtained from key contacts for the network being studied have been shown to be reliable (Marsden, 2005). In the cases where I was allowed to observe interaction, I also noted who was present and with whom they interacted. Towards the end of the first stage of the research, which was also the first year of the research, I compiled a database on interaction in the programme, which included individuals at DevAid, the HEA and across the eight projects. The main sources of data for the database were the interviews.

Taking a position-based approach, all individuals identified as network members by the participants in the research, that is, the individuals identified by participants as contributing to the decision-making process and the day-to-day implementation of the project were included in the structural network analysis (using both the qualitative and quantitative data) (Marin and Wellman, 2011). I firstly recorded the relational data provided by the key contacts of the programme/projects and then confirmed and supplemented the information they provided with that of the other project members interviewed and the data obtained via the participant observation and list of attendees at meetings made available on the projects' websites. The secondary data was only utilised to supplement the data obtained via the interviews in the case of missing data.

The database on interaction developed during Stages 1 and 2 was used to compile lists of network members to be included in the survey questionnaire administered during Stage 3. In the MozOptom DNO, the case explored in-depth during Stage 2, the list of network members (nodes), relations among network members (ties) and the frequency of interaction (strength of ties) were confirmed with two individuals who were part of the core management team of the project, one based in Europe and one in Africa. The sociogram (i.e. the diagram depicting social relations among individuals in the network) and brief report on the structural network analysis were sent to all members of this project for comment.

3.6.2 Data obtained during Stage 3 (survey data)

In recognising the embeddedness of the network in the social context of the larger aid programme under which the network organisation is funded, it was decided to include ties with members of other projects and the key individuals at DevAid and the HEA in the structural network analysis. In order to obtain a more comprehensive set of data, it was necessary to utilise a data collection method that was more systematic and also allowed for remote data collection in order to reach all involved in the DevAid programme. An online survey was thus considered most appropriate as the participants could receive the link to the questionnaire via e-mail and complete it in their own time regardless of their location. Employing a survey method to collect data for the structural network analysis was part of the research design from the beginning as it was realised early on that it would not be feasible to interview each individual part of the DevAid programme (i.e. individuals located in several different countries).

Before preparing the online survey, an electronic copy of the survey in MS Word and an Excel file that included the list of project members developed from data collected previously were sent to the key contacts of the project/programme via e-mail. The key contacts were asked to verify the list of project members and comment on the survey. I received feedback from five of the key contacts and revised the survey based on their feedback. I was also informed by the key contacts that three of the projects had completed and were not currently in full operation. These projects were thus excluded from the analysis.

The online survey was developed using the online survey programme, Survey Monkey, which is a popular programme for administering online surveys and is also less costly than other such programmes. The online survey was firstly piloted with four individuals (two academics and one PhD student in NEuro, and one IT manager at a research institution in South Africa) in order to assess the validity of the questionnaire. The pilot was conducted in May 2012. Ideally, the questionnaire should have been piloted with a sub-sample of the members of the programme/projects, but it was decided not to use this strategy as it was very important that *all* of the programme members be targeted for the final survey. This is crucial for yielding reliable data for the structural network analysis. The questionnaire was revised a second time and tested again by three of the individuals part of the pilot group before being finalised.

The link to the final questionnaire was sent to each of the key contacts in the programme who were requested to complete the questionnaire and also send it on to all members of their projects/teams. I also forwarded the link to project members whose e-mail addresses were made available on the projects' websites. The key contacts of two of the projects requested that the link only be forwarded to members of their project via them (citing confidentiality as a reason), so I did not send any direct requests to members of these projects except for project members I had met personally (for an interview or fellow PhD students).

The questions included in the online survey are included in the appendix (see Appendix 2). Data on the existence of ties and frequency of interaction was obtained from responses to the question, 'On average, how often do you communicate with each person below with regard to project-related topics? Communication can be face-to-face meetings, phone calls, internet calls, text messaging or emails'. Frequency of interaction was measured on a scale from 0 to 5 (0 = 'never', 1 = 'once or twice a year', 2 = 'quarterly', 3 = 'once or twice a month', 4 = 'weekly' and 5 = 'daily'). This scale is based on the data on frequency of interaction obtained via the qualitative data collection during Stages 1 and 2. Participants reported their ties in the network by selecting from the list of project members provided. This is considered a more reliable method than name-generator or free recall methods, which are more demanding and rely more on the memory of the participants (Marsden, 2005). Additional space was provided for participants to indicate additional relations, in case they were not included in the list. The survey also included questions about the modes of communication that the project members used in communicating with each project member and their use of ICTs for project-related activities.

The survey received an acceptable response rate from the members of the MozOptom DNO (i.e. 24 of 28 members), but very disappointing response rates from members of the other projects (on average, 21%). I sent out several e-mail reminders and called some project members in order to improve the response rates. After about half of the MozOptom DNO completed the survey, a shorter version of the survey (including only the three core questions on interaction) was sent to the members of the MozOptom DNO in June 2012 in order to motivate them to complete the survey. Due to the amount of time it took to chase-up responses, it was decided to focus attention on increasing the response rate from the MozOptom DNO. The key contact persons of all of the projects and the funding agencies completed the survey. Thus only the ties members of the MozOptom DNO reported to have

with actors at the funding agencies and the key contacts of the other projects were included in the analysis. This is considered sufficient for the purposes of the research.

3.6.3 Data analysis

The data obtained via the survey were entered into one-mode datasets, meaning that the data pertained to one set of entities (Wasserman and Faust, 1994). The first step in preparing the data for analysis was to delete all ties rated zero frequency (i.e. indicating no interaction). Since each participant indicated the ties they had in the network and the frequency of those ties, it was possible to confirm the responses of each participant (except in the case of the few network members who did not participate in the survey). The ties reported for each of the participants were matched for each of the questions on interaction – frequency of interaction, modes of communication, socialising and decision-making – to check for consistency in reporting. This strategy improves the reliability of the data (Marsden, 2005).

Few discrepancies in reportage were found. In the cases where two participants reported different frequencies with which they interacted, the difference was one unit in most cases (e.g. value of four rather than five on the frequency of interaction scale). The differences were dealt with by calculating the average frequency of the two frequencies reported. Some of the discrepancies were with ties between the project co-ordinator and other project members. In these cases, the frequencies reported by the project co-ordinator was favoured as the project co-ordinator's reports were deemed more accurate, based on the interview and ethnographic data (the differences in response were usually only one point on the frequency scale). If one participant reported interaction with another participant who skipped over his/her name (i.e. left it blank rather than reporting no interaction), the response of the participant who indicated interaction was used. For example, if project member A indicated that she interacted with project member B at a frequency of four on the frequency of interaction scale, but project member B skipped over her name (and did not indicate that he did not interact with her), then the interaction between project member A and B was entered into the dataset as having occurred with a frequency of four. The differences in response may be due to errors in memory or recalling interaction with individuals with whom interaction is not very often (Marsden 2005). Reporting a tie when there was none was considered more critical an error than not reporting a tie when there was one.

The dataset on 'friendship' ties or socialising among network members was elicited by a question requiring participants to indicate whether or not they communicated with other project members with regard to non-project-related activities by ticking a list. The condition for a social tie to be recorded in the dataset is that at least one of the nodes in the tie had to have indicated that they socialise with the other project member, and neither of the two should have indicated that they 'never' interact with the other project member in any of the four datasets on interaction. For example, if project member A indicated that she socialised with project member B but he did not indicate that he socialises with her (i.e. he left it blank), then the tie was recorded unless it was found that he also indicated in response to another question that he 'never' interacted with project member A. Project member A's response is thus not accepted as it is possible that she made an error and selected project member B by mistake. Again, reporting a tie when there was none was considered a more critical error than not reporting a tie.

Before analysing the data, multiple lines were removed except when analysing the formal and informal or 'friendship' relations together in one dataset. All interactions were recorded as non-directional ties (or edges) (Wasserman and Faust, 1994).

The data on the existence and strength of ties was analysed using a structural network analysis programme, Pajek (de Nooy et al, 2005), in order to identify the overall structure of the network and patterns of relations among project members. Pajek is a free to download programme and is one of the popular programmes for conducting structural network analysis (see Huisman and van Duijn, 2005). The data on modes of communication and use of technology was analysed using descriptive statistics in SPSS.

While structural network analysis (SNA) includes a range of statistical procedures serving different purposes, the present research focuses on three measures of cohesion and centrality most commonly utilised in the SNA literature: degree centrality, closeness centrality and betweenness centrality (Borgatti et al, 1998). Degree and closeness centrality indicate how easily information can reach a project member. Degree centrality refers to the number of ties in which each node (project member) is involved, and average degree indicates the structural cohesion of a network as more ties between project members yield a tighter structure (de Nooy et al, 2011). Betweenness centrality points out nodes acting as intermediaries in

communication networks and thus provides information about how crucial a project member is to the transmission of information through the network (de Nooy et al, 2011).

3.6.4 Brief summary of research methods

In summary, I employed a sequential mixed methods research design to explore the structure and dynamics of relations among members of the MozOptom DNO. The quantitative methods employed include: an online survey, structural network analysis (commonly referred to as formal network analysis in the literature) and descriptive statistics. The qualitative methods include semi-structured depth interviews, ethnographic research methods (including interviews, focus group discussions and participant observation) and thematic coding. With the use of a case-study methodology, the aim was to gain insight into the inner workings of the network (micro-level analysis), and the interaction between the network and the networks or fields within which it is embedded (meso- and macro-levels). This kind of systemic analyses is rarely conducted in the field of social network analysis (SNA) as it necessitates the collection of in-depth research on multiple sites. Through the quantitative methods, I was able to obtain comprehensive, 'fine-grained relational data' (Padgett and Powell, 2012: 3) on the network and a relatively comprehensive picture of the structure of the network. The qualitative methods allowed me gain in-depth insight into the day-to-day activities of the network and the dynamics of relations among network members. Working within a grounded theory approach, I aim to address the problem of lack of empirically grounded theoretical insight into the role DNOs play in the development of science, technology and innovation capacity (STI) in low-income contexts in Africa.

3.7 My position as a researcher and reflections on the research process

From a social constructionist perspective, it is important to indicate the position and background of the researcher, who is considered to co-construct the knowledge produced by the research with the participants (Lincoln et al, 2011). Highlighted in the mixed methods research is the importance for mixed methods researchers to explicitly state their training and experience in using both quantitative and qualitative methods (Lincoln et al, 2011; Small, 2011). My research background is research psychology (to Masters level), which is essentially a degree on research in the social sciences with a focus on psychological issues. I had training and experience in both qualitative research (e.g. conducting semi-structured interviews and focus groups) and quantitative research methods (e.g. the main method of analysis for my masters study was path analysis), but my training focused more on postpositive approaches. I

adopted a social constructionist approach as the main analytical approach to the present research as this approach was more appropriate (as discussed in detail above). I realised in drawing up the research questions for the research that postpositivist approaches are limited in addressing the gaps in the literature. I also attended an introductory course on conducting structural network analysis using Pajek.

In keeping with the social constructionist approach, I indicate my position, experiences and perceptions where relevant throughout the thesis. Some of my experiences and perceptions of conducting the research is included in this section with a focus on issues that arose during the research process.

In general, in the field I felt that I was well received by the participants in the research. I think the fact that I am a PhD student may have facilitated access. In the case of the MozOptom DNO, I think that each of the participants could identify with me and I could identify with their experiences to some extent as I was from Africa and had lived in each of the countries where the core organisations were located. One of the expat project members based in Tizangara City pointed out to me, when I first arrived in Tizangara City, that the management staff at the university was more receptive to me and welcoming than they were with him/her, and that it was probably because I was from Africa. I think that my approach as a PhD student wanting to learn about and understand the participants' experiences rather than criticise or dictate how things should be done or make demands on them, influenced how I was received. I also showed an open attitude to learning about the local culture and was aware of the importance of respecting rather than passing judgement on behaviour and cultural practices. My home country includes a diversity of cultures and several official languages. Thus the multicultural and multilingual setting was not entirely foreign to me.

I did, however, experience tension researching a group of people who had allowed me into the 'inner circle' and treated me as a 'somewhat friend'. The project members based in Tizangara invited me into their homes, to social events that they organised and attended, and to join them on their weekends at the beach. I often felt as though I was getting more than I was giving.

The fact that I am Muslim meant that I could identify with a major part of the culture in the region as more than 80 per cent of the population in the region was Muslim. I spent most of

the religious fasting month in Tizangara City when many of the students and (local) staff were also fasting, and thus we could identify with each other. One example is when the Rector introduced me to one of the staff at the university and stated that the staff member was Muslim as well and dressed similarly to me on Fridays (a religious day for Muslims). Some of the expat optometry lecturers also asked me to explain some of the cultural and religious practices of Muslim people in the community that seemed strange to them. Being a practising Muslim, I also did not feel comfortable at some of the social events as the expats often met at bars and restaurants where alcohol was served.

The main challenge that I experienced in conducting the ethnographic research was how to deal with (the perception) of crime in Tizangara City. As I carried out the research, individuals I interacted with in the field, mainly expats, informed me of their personal experiences and the experiences of people they knew who were robbed or attacked. I had initially carried my laptop around with me wherever I went as it was easier to record observations and type up notes on conversations and interviews. After being advised by several people, who have lived in Tizangara City for several years, to leave my laptop at home rather than carry it around with me, I decided to not to carry it unless it was necessary to do so. Stories of people's mobile phones being stolen (in the day time and at night) were common. I also experienced an attempted mugging while walking down the street. So, safety was always a concern for me. Tizangara City was described by the local people as one of the regions with the lowest crime rates in Mozambique, but the perception locally was that crime was increasing with increasing urbanisation. The feeling of not being safe, especially at night, hindered the research somewhat as I decided not to participate in the social events of the expats and project members late at night during the period in which I rented accommodation further away from the main street where the lecturers stayed. I had participated in the social activities at night during the first few weeks of the research as I had shared a house with a project member at the time and thus did not have to return home alone. There were also power cuts on several occasions when the street would be pitch black except for the generators of the banks and lights of the vehicles on the road. Also, one of the female lecturers was attacked by a gang on her way home from gym one night. These factors influenced my decision to not participate in social events at night when I rented an apartment further away from the project members. There were occasions when I returned home after dark as the practical sessions or events at the university went over time, but these were only on a few occasions and it could not be avoided. I do not think that I lost out much as I had some experience of these social events

having participated in similar gatherings during the first few weeks of the research and observed interaction during the day time. It is important to note that the feeling of not being safe was a personal experience and not everyone I met experienced living in Tizangara city the same way.

Another challenge I experienced was the lack of availability of participants. Key participants in Mozambique and Southern Africa travelled a lot and their schedules were unpredictable, which made it difficult to get them to commit to an interview. During the last two months of the research, it was difficult to keep track of my key contacts as they had spent some time out of Tizangara, attending conferences and meetings. The schedule of the university shuttle also changed each term and during the last academic term of 2011, the shuttle service was unreliable. I was informed by staff at the university that the shuttle services were cut back due to a lack of funds for fuel. The NGO then arranged for the optometry staff and project manager to utilise the private taxi services in the city when travelling between the university and the city. The schedule of the teaching team at the university was not predictable during the last two months of the research as their daily routines no longer followed the university shuttle pick up and drop off schedule. Most of the staff and students at the university and the network manager left Tizangara for holiday early in December 2011.

3.8 Ethical considerations

For SNA studies, the ethical considerations differ somewhat to that of conventional studies. Very little has, however, been written about the ethical consideration unique to SNA research (Borgatti and Molina, 2003). Borgatti and Molina (2003: 338) indicate that while SNA research includes similar ethical considerations to conventional research studies, SNA research requires 'extra care' for the following reasons:

- In SNA research, anonymity at the data collection stage is not possible as respondents have to identify themselves and the individuals with whom they interact by name in order for the researcher to record the ties.
- Complicating the issue of anonymity and confidentiality even further is the fact that network maps or sociograms are generally displays of raw data, and thus care has to be taken in developing these diagrams as they may reveal each participant's responses and identity.
- Although missing data is normal in social research, in SNA missing data is exceptionally problematic. Formal structural maps and analyses of patterns of relations in whole

networks are misleading if some ties are not reported and is particularly problematic as the researcher may be aware of exactly how the data is skewed or biased.

- Related to the issue of non-responses is the fact that individuals who choose not to participate in the research, and thus did not consent to be included, may still be included as ties with them may be reported by others. If the researcher elects to exclude the ties reported with those who did not participate, the analysis will then become misleading as chunks of the data will be missing.

For purely academic research – and thus the present research study – the most important ethical concerns are those related to anonymity and confidentiality, and the lack of consent from the network members who did not consent to be included in the research but were included in the data collection and analysis as other network members reported ties with them (Borgatti and Molina, 2003). In SNA studies using publicly-available data, this issue is not problematic as disguising the identities of those included in the analysis and sociograms is not considered necessary (e.g. Edwards and Crossley, 2009). In the present research, the data was collected via interviews, through observation of behaviour and with the use of a questionnaire. In all cases it was explained to the participants that anonymity could not be assured for the data collection, but that confidentiality was assured as no one besides my PhD supervisor and I had access to the data. The data was stored on a password protected computer, my personal laptop. Some backups were stored on a computer in the department, which was also password protected and only I had the login details. Also, participants were assured that any analyses made public, that is, analyses made available to anyone besides my supervisor and me (i.e. included in the thesis, publications or reports to the participants and projects) would not include their names. Instead, only the codes names assigned to them, based on their institutional affiliations, will be utilised when communicating findings with those involved in the DevAid programme. In writing up the thesis and for communicating with the wider public in general (e.g. for publication in academic journals), the data has been completely anonymised to the extent that the actual names of the projects as well as the names of the individuals involved will not be used.

Like with many small scale research studies, case studies in particular, complete anonymity to the extent that tracing back identities, although desirable, is not possible. The case study is of a very specific nature, includes a small group of individuals, and only one project of this kind exists in Mozambique. Although, it was initially decided to not report the actual country

setting in the write-up, we found that some of the meaning is lost if the specifics of the context in which the project was implemented is not included. I had discussed the issue of the necessity for anonymising the research completely with key individuals in the MozOptom DNO and a key individual part of another project (on different occasions). They pointed out to me that communication of lessons learned for future endeavours of this kind also depend on the context. For them, it was important to know the specifics of the projects. One of the managers at the African university mentioned to me that an error in the report I prepared on preliminary analyses referred to the university as the 'African university' and not by name. I think that anonymising the research completely, except for the use of actual occupational designations and the country context is a good compromise without breaching the confidentiality of the participants. Using the actual occupational designations assigned to the participants is essential for analysing and understanding structural position in the network organisation and the role of the social skill of strategic actors – crucial factors in the emergence and running of the network. The occupational designations are mainly utilised in the structural network analysis where it could not be avoided. In the qualitative analysis I opted to use code names and point to statements by groups of individuals (e.g. key decision makers) rather than individuals.

Furthermore, only those who participated in the research voluntarily were included in the analysis. Participants indicated consent in agreeing to be interviewed (via e-mail in most cases) and agreeing to complete the questionnaire. Participants were always informed that their participation was completely voluntary. I also contacted participants directly to request their participation in the research. In administering the questionnaire, the participants were sent an e-mail request by the key contact for the project (project co-ordinator/manager) to request their participation in the survey. The key contacts of two of the projects specifically requested that the request for participation be sent via them rather than by me directly in order for them to ensure confidentiality to the project members rather than them sharing their contact database with me. I only contacted individuals whose contact details were available on the internet or who I had met previously. Although using the strategy of having the project key contacts request their project members to complete the online questionnaire was useful as a way of ensuring that all project members were reached and received the online questionnaire, this strategy could be problematic as the project members could have felt coerced to complete the questionnaire. I was, however, copied in on the e-mail requests sent to the project members by the key contacts of the two projects, and it was clear from the

language of the e-mails that they were not being coerced to participate and they had also indicated that the research was not formally part of the project. In the end, few members of the projects (other than the MozOptom DNO) actually participated.

With regard to the issue of lack of consent of the non-participants, Borgatti and Molina (2003) indicate that, arguably, the reports of others can be considered reports on their perceptions of their relations and so, should be admissible and thus not be considered unethical to include. There is not, however, clarity on this issue. According to Borgatti and Molina (2003), two ways in which this problem can be dealt with is to 1) exclude the ties reported with those who did not participate in the research from the analysis or 2) to send consent forms to the entire population being studied and to include those from whom consent was received even though they did not participate in the research. The latter option is problematic as the consent forms and thus consent may not be received from all in the sample, which does not address the problem of missing data. The individuals may also not fully understand what they are consenting to if they decide later not to participate in the research. The problem of missing data remains an issue. Borgatti and Molina (2003: 343) state that,

‘Of course, all data are imperfect reflections of what is “really” going on. What makes this an ethical issue is that, in this case, we actually know that the data are distorted and we know in what way...To present the network as if it were a valid representation of the truth would be disingenuous to say the least, even if disclaimers were attached’.

It is thus important to obtain data on the whole network being studied. In the present research, all ties reported were included in the analysis as a way of minimising the effect of non-participation by a few of the network members. The steps taken to anonymise the analysis, ensure confidentiality and restrict access to the data are offered as a way of protecting the identities of the individuals included in the analysis.

Another important ethical consideration is the fact that the analysis has been made available to the participants, in anonymised form, and the final results will also be made available. This strategy is a way of showing appreciation to the participants for their participation in the research. As Borgatti and Molin (2003) indicate, this may create an ethical issue in organisational research when management may use the results of the network analysis in taking certain management-related decisions, for example, firing staff or withholding promotions if staff are deemed to not be performing based on the report of the analysis. The

results of the network analysis would thus have direct consequences for the participants and may be harmful. The fact that the results will be anonymised and that the project is almost reaching completion and many key members had left the project soon after the survey was sent out, minimises such potential harmful effects in the present research study. This issue would have been a real concern if I agreed to the stipulations, by the management of the network organisation, that I sign a confidentiality agreement in order to be allowed access to the 'inner circle', that is, being included in e-mails, being allowed to access organisational documents and being allowed into project meetings as a participant observer. Although that kind of access would have benefitted the research, the downside is that confidentiality of the data may have been compromised if management requested access to the data and results.

The way in which the ethical considerations above were addressed in the research is in accordance with the ethics guidelines outlined by the School of Social Sciences and Philosophy at Trinity College Dublin.

In the next chapter, the context of the African university (i.e. UniUS) where the optometry training programme was established is discussed. UniUS, in Tizangara, is an inter-dependent field in which the MozOptom DNO is embedded. I have argued throughout this thesis that the (socio-economic, political, institutional) context in which development network organisations (DNOs) are embedded, shape their activities and thus the achievement of the common development goals. I thus start the discussion of the analyses of the present research study with a discussion on UniUS, focussing on the challenges it faces and the strategies it utilises in dealing with those challenges. This discussion shows the 'development project' of UniUS as an autonomous organisation involved in the 'development project' of the MozOptom DNO. The discussion is taken further in Chapter 5 where I present findings on how the team based at UniUS in Tizangara worked towards achieving the DNO's objectives on the ground, transforming them in the process.

Chapter 4 UniUS and its developmental role in Tizangara and Mozambique¹²

In the previous chapters, I identified the research problem that the present research study aims to address: the lack of adequate theory and empirical research on the role of DNOs in STI-capacity building in resource-poor contexts in Africa. Working within a grounded theory approach, I approach the problem of lack of 1) theoretical tools by proposing the use of a network-institutional approach, and 2) the lack of empirical research by employing mixed methods social network analysis (SNA) to the analysis of a development network organisation (DNO) (see Chapter 2 and 3). With these analytical tools I was able to address the problem by analysing a case study (the MozOptom DNO) at multiple levels: micro- (i.e. inside the DNO – individual actions and ties), meso- (i.e. the DNO as a whole – structure and dynamics) and macro-levels (i.e. the interaction between the DNO and the fields within which it is embedded). This chapter focuses on one field in which the DNO is embedded, that is, the African university (UniUS) where the optometry training programme was implemented (see Figure 5 in Chapter 2).

The programme included a curriculum that was developed by the OptomNGO as a pilot ‘global curriculum’ that they aimed to implement in other sub-Saharan African countries as well. UniUS was one of the member organisations of the DNO and the main context in which the DNO’s activities were carried out. It was also one of the fields being transformed by the DNO. A description of the context of UniUS is thus a logical place to start the discussion on the role of the MozOptom DNO in developing optometry-related STI capacity in Northern Mozambique.

¹² As an exploration of ‘North-South’ aid-funded university networks, the research benefits from data on the involvement of higher education institutions (i.e. universities and institutes of technology) in the field of ‘development’ in a Northern European country and lower-income countries in sub-Saharan Africa. The term ‘university’ will be used in this chapter for the sake of brevity, but differences between universities and institutes of technology will be indicated where relevant. The field of ‘development’ referred to here is narrowed to a focus on capacity-building initiatives in low-income countries in sub-Saharan Africa. With regard to the African context, the analysis focuses mainly on the African university involved in the MozOptom DNO because of the in-depth information gathered on this university. The evidence presented in this chapter was obtained via the qualitative data methods, including the semi-structured depth interviews conducted with actors involved in the projects funded under the DevAid Programme of Collaboration (PCHE) and the ethnographic research conducted in Mozambique. Since the other projects are funded under the same aid programme, they can be seen as representing a particular kind of actor – a ‘North-South’ aid-funded development project led by higher education institutions – with similar attributes to the MozOptom DNO.

More importantly, as Cowen (2007: 15) indicates,

When a model of pedagogy, or a curriculum idea or a model of a university or university system is moved across international boundaries, there is a *double* osmotic problem to be understood: the one which happened in the old society and the one which begins to happen in the new.

Cowen (2007: 15) refers an 'osmotic problem' as the problem of how 'societal "pressures" work so that educational institutions and processes take on some of the style and characteristics of the society in which they are located'. Hence, the implementation of a curriculum developed in one country by a specific group of individuals cannot simply be transferred to another country context to be implemented by another group of individuals. It is not simply a process involving the transmission of teaching and study materials from one actor in one country via Dropbox or some other mechanism to another actor in another country. This is only part of the story, as shown in the next chapter.

In conceptualising networks as transmission systems and strategic action fields, I show how the optometry curriculum was produced by the OptomNGO and transformed by the actors at UniUS who had to find ways to implement it within the existing institutional systems (i.e. formal university norms, informal university norms shaped by the interaction between the students and the staff) and limitations of the context. An understanding of the institutional, social and physical contexts is thus essential for understanding the process by which the training programme (i.e. one of the main 'development products' of the DNO) was established. This is the focus of this chapter.

A description of UniUS and the context in which it is embedded is described next. Secondly, the role of the university in producing skilled human capital and research outputs is discussed, followed by a discussion of the role of UniUS as a modernising agent in the Northern region of Mozambique. The fourth section focuses on the strategies that key actors at the university employed in overcoming the challenges presented by the context, which constrained the ability of the university to carry out duties related to its role in the MozOptom DNO. The fifth section briefly describes the ways in which the European (NEuro) universities involved in the projects funded under the DevAid Programme contributed to the development of capacity in sub-Saharan Africa. The last section concludes the chapter.

4.1 The higher education sector in Mozambique

The higher education sector in Mozambique, in general, is relatively young. After independence, in 1975, developing the higher education sector in Mozambique was placed on the national development agenda as part of the socialist ruling party's (Freelimo) development strategy (Barnes, 1982). According to Barnes (1982), Freelimo criticised both the colonial and traditional education systems. They sought to develop new curricula based on scientific knowledge rather than traditional knowledge. Essentially, they wanted to develop a 'new mentality' ('New Man') that was not rooted in the knowledge produced by the colonial curricula or superstitious beliefs of traditional tribal cultures (Barnes, 1982: 410). After independence, the Portuguese were expelled from the country and since they made up the majority of the teachers and skilled human capital in the country, Mozambique had to start developing indigenous human capital. This journey was, however, paused during the civil war which lasted until 1992, after which Frelimo became the first democratically-elected government in Mozambique. Curriculum reform at primary school level took place between 1997 and 2004, with the new curriculum introduced in 2004. The new curriculum includes two components: a component specified by the national government (80%, which is also shaped by international trends) and a component specified by the local community in which the school is based (20%) (Alderuccio, 2010). The curriculum that children are taught is thus more vocationally-oriented and of some relevance to the local context. The government has declared the colonial language, Portuguese, as the official language as a way of countering 'tribalism', but this has complicated literacy campaigns as it was spoken by less than a quarter of the population in the 1990s (Ngunga, 1999).

The first Higher Education Act was implemented in 1993, after the civil war (Chilundo, 2006). With World Bank funding, the Strategic Plan for Higher Education in Mozambique 2000-2010 was completed in August 2000, and for the first time, Mozambique had a higher education strategy that included the development of the sector as a whole rather than a focus on Eduardo Mondlane (established in the colonial times) (Chilundo, 2006; Gondwe, 2011). The strategy shifted from a socialist to a market-driven strategy (Gondwe, 2011). The higher education system in Mozambique includes five different types of higher education institutions (HEIs) is characterised by lack of funding and other resources and thus has a low level of absorptive capacity (see Gondwe, 2011) with less than five per cent of the population participating in tertiary education.

Currently, the role of higher education in developing science, technology and innovation (STI) in Mozambique is highlighted in the national STI policy (MOSTIS, 2006). In MOSTIS (2006: X), the necessity for developing a 'culture of innovation, founded on science and technology' (STI) is highlighted. The guiding principle is that new cultural institutions cannot simply be superimposed on traditional institutions. This perception is echoed in the African Manifesto for Science, Technology and Innovation (ATPS, 2010), for example.

In 2010, the law regulating the higher education sector changed due to a change in the Ministry of Education. Higher education, which was previously part of the Ministry for Science and Technology, was then moved to the Ministry of Education. A change that had a major impact on the MozOptom DNO is the change in degree structure, reverting to the stipulation of four-year degree programmes rather than implementing the Bologna Process. There was consensus within the sector that a foundation year was needed in all programmes in order to bridge the education gap between secondary and tertiary education due to the poor quality of schooling at secondary level (SARUA, 2012). Universities now have to produce degree programmes lasting at least four years. The flexibility in the system is being tightened so that all HEIs in the system follow the same regulations (see Gondwe, 2011).

Today, the higher education system includes 13 private HEIs and 13 publicly-funded HEIs (including universities) (SARUA, 2012).

4.2 The University of Science, Northern Mozambique (UniUS)

UniUs is one of the youngest public universities in Mozambique and is the only science university in the Northern region of the country. It was established in 2007 with just 140 students enrolled in three degree programmes in health: medicine, dentistry and pharmacy. The faculty of health sciences, where the optometry department is located, was the first faculty at the university. Since then they managed to offer at least one new degree programme each year. In 2008, they started offering degree programmes in nutrition, biology, information technology and architecture. In 2009, optometry and engineering were added. Nursing was added in 2010. The faculties are spread across three provinces in the North. The first optometry students graduated last year (December 2012) and were among the first graduates of the university. The DNO thus played a crucial role in developing the university, providing the university with the means to expand its degree programmes.

UniUS is an interesting case to study for the purposes of the research because it is a young university. The management at the university does not have the 'baggage' of colonial roots – that is, the cultural and resource dependency on well-established universities in Europe – that long-standing African universities have (Mazrui, 1975). Unlike many traditional research universities in Africa that are experiencing pressures to modernise in order to adapt to new pressures in the global economy (see Mario et al, 2003), UniUS can and has developed its own pedagogy strategy that is suited to the local context (see below). This does, however, mean that it also had to start literally from nothing, which presented major challenges for the MozOptom DNO as even the physical facilities and furniture for the optometry programme had to be sourced by UniUS, which operates with very little public funding. The fact that universities are considered to be autonomous entities, means that the Rector holds a status similar to that of a Minister of Parliament (Collinson, 2011), but also that universities are expected to source much of their own funding (rather than rely mainly on public funding) (Gondwe, 2011).

The priorities of UniUS are indicated in its vision and mission statements. The vision statement of the university is to be an institute that strives for excellence and quality, is competitive and is internationally recognised (UniUS's website, 20 March 2013, translated from Portuguese: 'Ensino Superior de excelência, qualidade, competitividade e de reconhecimento internacional'). The mission statement indicates the importance management placed on developing indigenous capacity in science and the role of science in 'development':

Scientia, Cretus, Fides (Science, Development, Faith/Commitment) (UniUS's website, 20 March 2013)

One of the Directors at the university elaborated on the mission in an interview:

The first word refers to the commitment of the university to using science for development....The second word in the logo refers to the commitment to building capacity for development in the Northern region of the country. The region has less graduates than the Southern region and there are more graduates in the social sciences, business and law in particular...The third word refers to the methodology or teaching strategy used at the university...The emphasis is on the community and the students have to have contact with the 'native population'...learning by observing and doing...graduate almost ready for work. (Notes on interview, UniUS Management 3)

The vision and mission of UniUS shows its 'modernisation project' for transforming the socio-economic and political context especially in the Northern region of Mozambique. Cowen (2007) emphasises that educational models are rooted in broader national and global political-economic contexts and are best understood as such. It is evident that the vision and mission of UniUS reflects priorities of the broader national and global political-economic contexts, with the 'modernisation project' linked closely to the local African context and aiming towards globally promoted priorities of cultivating a culture of learning and internationalisation (see Cowen, 2007; Gumport, 2007).

The broad range of challenges the university faced in establishing itself as a legitimate, internationally recognised organisation in the local context and the strategies key actors at the university utilised for meeting the needs of and driving development in the local context, are discussed next.

4.3 The role of the university in capacity development (human capital)

Like most universities globally, UniUS faced two challenges: 1) addressing development needs of the local context (community, national and regional contexts) in an increasingly globalised world, and 2) establishing the university as a global institution playing a role in the global economy. While universities globally are under pressure to respond more directly to the needs of the social, political and economic contexts in which they are embedded (see Gumport, 2007), this need is more pressing in low-income contexts because of the critical lack of indigenous skilled human capital (Cloete et al, 2011). This meant that the university was under pressure to address this problem by producing skilled graduates who could serve the needs of society almost immediately. It also meant that they had to achieve this goal in a context where there was a critical lack of human capital, including a lack of skilled individuals for teaching and administration.

The strategy that management employed in order to address the first challenge involved the selection of an education model for the production of graduates equipped with the theoretical and practical skills to go from university straight into the private or public job market, one that would also be internationally recognised. With regard to the latter problem, they employed a strategy of recruiting expatriate teaching and administrative staff to compensate for the lack of local expertise. The staff working at the university thus included a mix of expatriates and locals, including individuals from the local communities in the province and other provinces in

Mozambique. Several of the Directors at the university came from other parts of Mozambique.

4.3.1 Narrowing the skills gap

The educational model adopted by the university was based on an internationally recognised model, a model of problem-based learning (PBL). This model was developed in the Netherlands and has been utilised widely (e.g. in the Netherlands, United Kingdom, Mozambique and South Africa), especially in medical schools (Aarts et al, 2010; Woods, 2003). It has been in use (for over ten years) by another public university with campuses in the central regions of Mozambique (Aarts et al, 2010). The university management team at UniUS thus found it suitable for UniUS. A Director at the university described the education model adopted:

UniUS Management 3: ...with this strategy...[the] students graduate almost ready for work...the strategy was similar to PBL, problem-based learning, that UCM (the Catholic University) used and that the Cubans used for teaching medical doctors.

Rather than emphasise theory, which is prioritised by more traditional educational models for universities, the university emphasised practical training so that the graduates possessed the theoretical and practical skills necessary for serving societal needs. The idea is that they would be ready for work soon after they graduate. The PBL model reflects the emphasis on developing a culture of learning and teamwork in the network society (see Castells, 1999; Cowen, 2007).

Furthermore, following a problem-based learning model, all of the students were required to complete a foundation year before moving into the stream of study for which they were enrolled. The aim was to provide the students with a good grounding or foundation in basic science subjects and languages (Portuguese and English), which is essential considering the poor quality of schooling generally in Mozambique and in science, in particular (Aarts, 2010; Gondwe, 2011).

Besides the poor quality of schooling, another problem that the university faced in recruiting students was the lack of interest in science subjects among school students. Of the small proportion of students entering university, the vast majority enrolled in the social sciences. Two members of the management team referred to the situation as a 'vicious cycle':

UniUS Management 4: ...in 2008, two thirds of the population, they were following, er, arts. So, they were following Portuguese, history, geography, humanities...They were afraid of natural sciences...So, if we don't have, er, enough, um, students in the natural sciences, we will not have enough lecturers. So, it's like a cycle.

UniUS Management 2: A vicious cycle.

Another challenge is the fact that the physical location of the university was a great distance from the capital city. They thus found it difficult to attract students to take up studies in the less developed Northern region of the country. They also reported difficulty attracting and retaining skilled personnel for running the university. There is a saying in Tizangara that nobody really comes from there, they are either from somewhere else or are just passing through. This was because the region is relatively isolated. It is located a great distance from the capital city and the other major city in central Mozambique that offer greater education and job opportunities. Interestingly, statistics show that immigration and emigration in the region were relatively equal in 2007 (www.ine.ac.mz).

4.3.2 Producing graduates in a context characterised by a critical lack of skills

UniUS Management 4: So, the university started with all [these] main constraints: the lack of specialised human resources not only for lecturers but also, er, administrators to run the finance, to run the, in other areas to support the main activities, which is the instruction and research and extension activities. So, we started with this and we still have [these] problems. (Interview with UniUS Management 4 and UniUS Management 2, Directors at the university)

The Director quoted above pointed out the challenge of the lack of local expertise for teaching and administration that the university faced in the beginning and continued to face years after. For example, expertise in optometry did not exist in Mozambique when they opened the optometry degree programme in 2009. For other degree programmes offered by the university, all in the sciences, very little local expertise existed. For example, when introducing the nutrition programme in 2009 there were less than 10 nutritionists in the country. They thus had a small pool of professionals locally from which to source expertise for teaching and administration at the university. A strategy that involved recruiting locals, where possible, and importing expertise to compensate for the shortfall, was thus considered necessary. One of

the members of the management team stated that, for the moment, they were forced to 'import' expertise as well as other goods due to the low levels of development in the country (Interview, UniUS Management 2).

The great expense of hiring expatriate teaching staff meant that opening and running degree programmes was an expensive endeavour. Hence, due to limitations in funding, there were times that the university did not have sufficient funds to recruit teaching staff (mainly expatriates), forcing them to postpone the opening of some degree programmes:

UniUS Management 2: ...you have to look at teachers needed for the course, if we afford it or not. OK. If not, just tell them, 'Please wait for the right moment for that because we can't...afford to bring teachers because for this course not only national teachers. We will need expertise from abroad. So, just wait because we don't have enough money'.

In order to improve the quality of teaching at the university and the status of the university, plans were in place to ensure that all of the teaching staff were in possession of at least a Master's degree by 2015 (interviews with four members of high-level management at UniUS). The main strategy that they used was to offer scholarships to current staff to undertake postgraduate studies abroad. Scholarships were offered for study mainly in Brazil and Portugal. Some of the staff was already in receipt of these scholarships.

Each year, the Mozambican government funds students' postgraduate studies at local universities and universities abroad with the help of aid funding. It was expected that these students would return to Mozambique once they had completed their studies in order to contribute to national 'development'. Some students have reported that the scholarships were insufficient to support their studies abroad (allAfrica.com, 23 October 2012). The Mozambican government has begun working towards improving the system (allAfrica.com, 23 October 2012). There have also been reports in the media about high-level corruption in the Ministry of Education where large sums of money were embezzled over a period of a few years (allAfrica.com, 23 October 2013). Students also benefitted from scholarships offered by other sources. For example, the lead institution involved in the MozOptom DNO (NEuroIT) offered scholarships for staff at UniUS to undertake postgraduate studies through the institution. This was not formally part of the 'development project' of the MozOptom DNO. A problem encountered in this case was the lack of interest by staff at UniUS.

Besides these challenges, traditional cultural values are also more entrenched in provinces in the North. Challenges related to this are discussed next.

4.4 The university as a (African) modernising agent¹³

Driving through the streets of the city and rural communities on the way to the university campuses of UniUS located at the edge of the Tizangara City, the low levels of physical development is apparent. This excerpt from the field notes provides a description of the physical context:

I took the machibombom [university shuttle] to [the new campus] again today. I'm always amazed at how rural the area is. When crossing a small bridge on the way from [the old campus] to [the new campus] campus, I noticed people standing in a large puddle of water. It looked like they were washing, splashing water on themselves. The water was a milky colour though. When the bus passed they stood and looked up at us. It felt like we were in a special bus (a capsule) being driven from the city to the university. Along the road there were mostly bushes and trees with some mud houses scattered in between the bushes. The road we travelled on was a red gravel road. The drive was bumpy. (Field notes, 24 May 2011)

The streets were dusty from the light-brown-red-coloured sand and it was almost always scorching outside. However, the moment I entered the doors of the university and the classrooms and offices, the air was cool as all of the rooms were fitted with air conditioners or fans. Along the road, informal traders sat or stood next to the handful of goods they were selling, which were usually simply laid out on the ground or placed on makeshift stands (made from cardboard and/or stones) or small tables. The streets were often littered with bird's feathers, fruit peels, plastics, etc. with garbage dumped in designated areas along the road rather than in bins. In contrast, the gardens of the university campuses were well-kept and the premises were relatively clean. Outside, adults and children wearing ill-fitting, torn and dusty clothing, and people with physical disabilities sitting along the sides of the road, were common sights. This is not to say that many people selling goods and walking along the streets were not well-dressed as well. Within the halls of the university everyone interacting the

¹³ In this chapter the term 'traditional' is used to refer to historically entrenched cultural and religious values and norms without any value judgement about whether these facilitate or impede development. Also, a distinction is made between cultural and religious values as research has shown differences in practice between the two (e.g. UNESCO, 2002).

social space, was relatively well-dressed and most wore 'western-style' clothing like university students at university campuses located in Europe, for example. Some of the students also had laptops, which they worked on during the lectures. At the end of the day, shiny sedans and 4x4s were parked in front of the university's main entrance, waiting to collect the students. Some of the students also drove themselves. Many students utilised public transport as well.

The point of the description above is to convey the message that the physical and social spaces of the university campuses contrasted with the local context, and these spaces resembled that of well-established university campuses in other countries (high-income and lower-income). The shops and offices in the commercial centre of the city and the expensive hotels were other physical and social spaces that resembled shops and office spaces in just about any modern setting. The university campuses and classrooms were, however, relatively smaller. For example, the library consisted of two small rooms, one where the books were kept (on bookshelves), and the other, included desks and chairs where students were allowed to sit and read the library books. They were only allowed to use the books in that room. Also, there were no large lecture halls except for a large multi-purpose hall.

As Lauer (2006) shows, these contrasting images are all images of modernity in sub-Saharan Africa. Lauer (2006) thus cautions against the use of 'traditional versus modern' dichotomies, which are misleading in that they convey inaccurate descriptions of cultural practices in Africa and are unhelpful for solving social dilemmas.

One of the major challenges that all, except one, of the actors at the level of management at UniUS reported is establishing the university as an institution in a social setting where traditional institutions were valued. Having spent some time studying and, in some cases, working in countries where global university institutions were well-established, they found it challenging to inculcate the same values in the local communities without marginalising the university as an elite or foreign system. As one of the Directors reported, on returning to Mozambique after working overseas for a few years, he had to relearn some of the traditional institutions, like showing respect by using the right hand when handing something to someone.

Two specific challenges that related to establishing the university as a global institution in the local context include: 1) institutionalising global university and organisational values and norms among the students, lecturers and administrative staff, and 2) dealing with limitations presented by the socio-economic context.

4.4.1 Lack of value placed on education

Members at the level of management at UniUS reported that one of the difficulties they experienced is attracting students to enrol in the sciences. As individuals involved in developing the field of education in Mozambique, they faced the hefty task of trying to change local values and mind sets, which were more entrenched in the north of the country. Only 31 per cent of the population in Mozambique lived in urban areas in 2011, and this proportion was considerably lower in the Northern provinces (<http://mozambique.opendataforafrica.org>, accessed 24 March 2012). Also, households rely mainly on subsistence and smallholder commercial farming (see de Vletter, 2004). The challenge presented by this situation is that children are often relied on to support farming activities and thus the livelihoods of the household rather than attend school. One of the key members of management stated:

UniUS Management 2: And we have, in some districts, parents telling their kids, 'Oh, I need you for my fields of maize...So, you have to stay here with us to help us'. No, it's very, er, can you imagine someone telling his parents, 'No, I can't do that, I have to go to school'?

He continued to explain that there is a need to show families that alternatives to traditional livelihoods exist and education is important for future generations to escape poverty:

UniUS Management 2: ...one of the things that we do is convincing the parents as well, when UniUS does this programme... 'Don't only thinking, or imagining, Oh people from Maputo, from Tizangara City, that's for them'...We have to get rid of this mentality that I was born poor, I have to die poor.

As indicated by the quote above, UniUS ran a special programme that involved the university sending teams of representatives to secondary schools and rural communities in order to inform students and communities of the degree programmes offered by the university and the potential benefit of education to national 'development'. The teams generally consisted of a Director at the university, lecturers and students. The team of representatives usually took

photographs and the prospectus of the university along on their visits. A DVD describing the university was also produced. The students in the team were expected to share their experiences of being a student at UniUS with the students at secondary schools and explain to them the requirements for entering university (Interview with UniUS Management 2). It was expected that the secondary-school students would best identify with individuals similar in age. Also, university students are living proof of the possibility of attending university. The team also informed students about the bursaries offered, by the university, to financially disadvantaged students. This strategy was reported to be effective by some of the optometry students, who participated in the focus group discussions, as it was through these team visits that they found out about the programmes offered by the university and were motivated to apply to study at the university.

While the university planned to run the programme annually, this depended on whether they received funding from the state. During the year in which the field work for the present research was conducted, the university could not send teams out because their funding application for the programme was not approved by the state.

4.4.2 Institutions taught through initiation ceremonies versus secular education

Traditional institutions (cultural norms) related to gender roles in the social context were reported to be an additional challenge (interview with UniUS Management 2). Young people in Mozambique are taught gender roles and general traditional values through initiation programmes in which they are expected to participate in their early teenage years. The initiation ceremonies mark the end of childhood and start of adulthood. Adult relatives are usually responsible for conducting the initiation ceremonies. During the process of initiation, boys and girls are taught their roles in their families and communities. They are taught how to treat their husbands/wives. While girls are taught to only engage in sexual intercourse after marriage, boys are encouraged to engage in sexual intercourse soon after they return to their communities after the initiation ceremony. Girls are generally encouraged to marry and are taught to be subservient to their husbands. Some authors have, however, reported that, in some cases, initiation ceremonies were found to be empowering for females as young girls were taught how to take precaution against contracting HIV/AIDS, for example (Kotanyi and Krings-Ney, 2009). Mozambique is reported to have one of the highest rates of child marriage in the world, with 18 per cent of females in the 20 to 24 year old age group reported to have been married before the age of 15 in 2003 (www.unicef.org). Teenage pregnancy is common

(www.unicef.org). These institutions contrast with the values that the university tried to inculcate.

Furthermore, in the northern region, only 12 per cent of the population over the age of five enrolled in primary school in 2007, five per cent in secondary education and 0.1 per cent in tertiary education (www.ine.gov.mz). The enrolment rates were a bit higher for Tizangara City (23.5%, 20% and 0.5% respectively) (www.ine.gov.mz). Considering that UniUS was only established in 2007, it is likely that enrolment rates would have increased slightly since then. Illiteracy rates for the population in the Northern Province were, however, significantly higher for females (77.4%) than for males (46.5%). The values were considerably lower for the city (15% for males and 37% for females). The university thus had to develop a strategy for improving the participation of females in higher education, as a key member of the management team at the university explained:

UniUS Management 2: Usually we like to invite, um, teachers, ladies, because it's a good, it's a good way of convincing girls because of the problem of going to school is girls. Girls refuse because of parents or because, um, early marriage...they give up studying. Early pregnancy...You are a girl, it's important to gain your independence in the future. OK. Not only depending on the will of your man at home...In this part of Mozambique is very, that is very strong.

4.4.3 The case of 'spirit possession'

Besides traditional gender roles and the low value placed on university education in rural communities, the students also introduced institutions related to their religious beliefs and cultural values into the social spaces of the university. Cultural beliefs related to spirit possession were common in the Tizangara City. Symbols of this belief included prayers for protection from 'evil' that were displayed on the doors and/or windows of many of the shops and houses. These symbols were not as common in the capital city of Mozambique. One of the key actors at the university described one occasion where a student was thought to be possessed:

UniUS Management 2: I learnt about some cases in our university...Um, it was in a lesson. All of a sudden, brrr, she went on the floor and started to speak many languages...But she didn't...know all those languages, you know, from other provinces...what they did, the colleagues, was to let her

[calm] down. But she didn't [calm] down at all. They, um, they called to her father. Her father took her home. And after that, after two days, they calm down. And what they did, I think, to call someone traditionally, doing some ceremonies at home. And she's OK now. She returned to school.

This quote also indicates the procedures that staff at the university are expected to follow in such cases. According to the actor quoted above, the policy of the university is to firstly call the student's family and allow the family to deal with the issue in whichever way they wish. The actor quoted above continued to explain that they, management at the university, considered it important for staff at the university to respect the cultural values of the students and their families:

UniUS Management 2: It's important to call the family, inform the family about what happened. Not to take measure, giving medication...OK, if it involves the security, the safety of the student in terms of physical safety, they call [the] hospital, and they take [the student to] hospital. That happened once actually...What the university does is to call the family to follow the student to hospital.

Three of the expatriate lecturers also discussed beliefs about spirit possession held by some students. Since they were from different cultures (in Europe and Latin America), they did not understand these cultural beliefs and were not sure of how to deal with them, as indicated in this excerpt from my field notes (18 May, 2011):

The conversation then moved to talking about the students. (Optometry Lecturer 1) and (Optometry Lecturer 2) said that a student told them s/he had performed poorly on a test because s/he was possessed at the time and was not him/herself. (I think it was a girl but they didn't reveal identifying information. I wasn't sure if they were talking about one or more than one student.) S/he asked for an increase in marks. (DNO Core Management 3) replied that she was very strict with the students and would not give an increase. (Optometry Lecturer 1) and (Optometry Lecturer 2) agreed and said that they had refused to give extra marks as well. They said that the students used the 'excuse' of possession. They said that they didn't understand the religious reasons.

The discussion above illustrates the tension between university institutions (based on global institutions) and local traditional institutions that staff and students carried into the social spaces of the university (see Padgett and Powell, 2012). According to one of the key actors at the university, who is Mozambican, traditional beliefs in spirit possession are widely held in Mozambique. It is part of the development plan of the state to gradually reduce the emphasis placed on superstition (such as spirit possession) as these beliefs are thought to hinder development (Interview, UniUS Management 2).

4.4.4 Traditional medicine versus modern medicine

The need for the socialisation of STI in the local context was reported by all except one of the members of the management team interviewed. The dominance of traditional medicine and distrust in modern medicine shows the challenge that the university faced in striving to serve the needs of the local context. A member of the management team involved in the co-ordination of teaching in the health sciences faculty stated:

UniUS Management 6: ...as you know, we are a poor country and many, and our community, sometimes they [don't] know or they believe in the traditional medicine [rather] than the modern, conventional medicine...they say, No, since I was born I have never [used] some treatment like this...

He continued to describe the lack of interaction with and distrust in modern medicine in the local communities by providing an example:

UniUS Management 6: Many times it is difficult to communicate with the community because they can't speak Portuguese...our communities only speak in the dialect. Or, for example, cholera...Um, cholera is the same name [as] chloro [in the local dialect]. Chloro is medicines. You know, chloro is medicine, cholera is disease. People with no education, they can't [tell the] difference...And you say, I'm using chloro to treat [the] water. But someone says, 'No, they are putting cholera in the water'.

This quote indicates the problem of language differences and how it can add to the challenge of lack of knowledge of and value placed on modern medicine. The university had to overcome these barriers in order to establish itself as a legitimate institution in the local context. The 'One Student One Family Programme', that involved students visiting households in the nearby communities in order to educate them on basic health practices, is an example

of a mechanism that the university developed for forging links with local communities and socialising science in the local context (see Chapter 5). When the students went into the communities as part of the programme, they wore their white coats with the university's logo on the pocket. The white coat was a symbol of authority as it conveyed their professional identities. Through this programme, the students and lecturers conveyed formal knowledge of the sciences and norms and values of the sciences to the household members. Through an emphasis on prevention rather than treatment, the objective was to change basic hygiene and lifestyle practices. The students also collected data on health practices in the local communities, which the university aimed to utilise in informing the services they provided.

4.4.5 Strategies for establishing global university institutions at UniUS

The policy of UniUS for dealing with traditional institutions that the students 'carried' into its social spaces was to inform students that their cultural and religious institutions were respected and accommodated. But that there were certain institutions that were necessary for them to adopt in attending the university. These institutions were similar to those at universities globally, as a key actor at the university indicated:

UniUS Management 2: We have our rule of university. We don't say that, please don't bring your cultural behaviour here. We tell them the rules of the university in a way for you to have good condition for learning are this and this and that. We don't go over your rules, any rules, but for education you have to come to school to the lessons punctually, you have to follow the instructions of the teachers...to have respect for adults that's [easy]. You have to follow all the instructions. If you want to learn something from here, follow everything. Sometimes you'll find it difficult, just go and, and find someone adult to help you, if you trust someone, go and talk. If you don't trust anyone, OK, it's up to you.

They thus relied on students internalising university institutions rather than relying heavily on social mechanisms for control (see Berger and Luckmann, 1967; Fligstein and McAdam, 2012). At the departmental level, the optometry teaching staff, for example, reported the challenge of inculcating basic 'professional' institutions among the students, like attending classes, punctuality and treating the classroom as a quiet working space. One of the lecturers reported that she used empathy and humour to point out and attempt to change what she considered inappropriate behaviour at the university. Inculcating these basic norms was also part of the

professional training the students received. This is discussed in greater detail in Chapter 5, which focuses on the development of the optometry profession in Mozambique.

Similar to the students, the staff at high-level management at the university and lecturers carried institutions and formal knowledge from elsewhere into the social space of the university (see Padgett and Powell, 2012). Members of the management team, most having studied overseas, and the expatriate lecturers carried institutions internalised through interaction in other social networks into the social networks at the university. From institutionalist theories, we understand that the knowledge (tacit and formal/codified) would be produced and reproduced through interaction with others in the social spaces of the university, and would be transformed and shared as well through interaction (Fligstein, 2001; Fligstein and McAdam, 2012; Padgett and Powell, 2012). They also introduce formal knowledge gained outside of the country into the university system. From this perspective social networks are learning and teaching systems.

The expatriate teaching and administrative staff at the university were mainly from Cuba, Brazil and Portugal. Considering the similarities in social and political context as well as language, it is apt that the university management recruited professionals from these countries. Two members of the management team did, however, report that importing teaching staff from Cuba was not desirable because Cubans speak Spanish rather than Portuguese, which is the official language in Mozambique (interviews with UniUS Management 4 and UniUS Management 2). There was, however, a strong presence of Cubans as a result of well-established bilateral ties between the two countries, particularly in the areas of science and technology, education and health (see for example, allAfrica.com, 6 March 2008).

Interestingly, only a handful of the teaching staff, local and expatriate, possessed postgraduate qualifications and many of them were in the optometry department. A major reason is the fact that highly qualified experienced lecturers tend to have better career opportunities in their home countries. Furthermore, experienced professionals tend to be more established in their careers and personal lives (e.g. have children). It was thus difficult to attract these individuals for relatively short-term contracts (one-year contracts) in Mozambique. In order to attract and retain expatriate teaching staff, the university offered salary packages with extra benefits, including accommodation, transport, internet access and

a stipend. Local staff did not receive the added benefits. Recruiting expatriates was thus more expensive than recruiting locals. The university did, however, try to make the salary packages for local staff attractive so that they did not feel the need to take on other work to supplement their salaries. Having more than one paying job meant that teaching staff spent less time on teaching activities, which would negatively affect the quality of teaching. A key member of the management team at the university stated:

UniUS Management 2: There is a shortage of teachers. And for them to be in that university only is not enough because of the wage. So, they have, er, other sources of money. And that's what we are trying how to do [at] UniUS, trying to talk to teachers and giving them [added] conditions in a way to stay all the time at university...

However, in reality, as it is indicated in the quote above, many of the local lecturers held other jobs as well in order to supplement their salaries. Some also taught classes at other HEIs, often the private HEIs. This was common knowledge among the local and expatriate management and teaching staff at the university. The common practice of teaching staff at African universities engaging in paid work at private higher education institutions and elsewhere is well-documented in the literature (e.g. Rønning, 2012).

In order to inculcate university institutions among the teaching staff at the university, pedagogical workshops and seminars were held and a member of the team co-ordinating pedagogical activities observed lectures from time to time in order to offer supervision to the teaching staff. The teaching staff would receive feedback about their teaching styles immediately after the class (Interview, UniUS Management 2).

This was one quality assurance mechanism that the university utilised. The workshops and seminars were seen as platforms for knowledge exchange between the expatriate lecturers and locally-trained lecturers (Interview, UniUS Management 2). They were encouraged to share their experiences of teaching and teaching styles. The merits of internationally renowned educational theories (e.g. by Piaget, Bruno and Vygotsky) were also discussed in the seminars and workshops.

Although many of the lecturers (local and expatriate) did not have postgraduate qualifications and did not have much teaching experience, the expatriate lecturers were reported to have

better teaching styles than the local lecturers. This was reported by the optometry students at all levels – first, second and third years –, who would have completed a foundation year taught by non-optometry, local and expatriate staff. Two of the students stated:

P3(dec): And also, it depends on where the lecturer was trained. So we have a lecturer who was trained in Portugal but she is Mozambican and she teaches very well. So, [maybe] it also depends on where the lecturer was trained.

P5: And the lecturers who are Mozambicans but were trained outside are the ones that perform well.

A strength of the expatriate lecturers, generally, was that they tended to try to understand their students and adapted their teaching styles according to what they thought would be most effective for the context:

P4dec: I think that the Mozambican lecturers are the ones who must adapt to the teaching styles of the lecturers from outside. The lecturers from outside they teach what they feel the students might know, while the lecturer from Mozambique they have the tendency to show that they know better than the students.

P5dec: Because also, the lecturers from outside, when they come to Mozambique, they try to find out how we learn. So they try to adapt themselves to our reality.

Furthermore, according to the students, the match between the professional expertise of the lecturers and the course(s) that they taught had a significant impact on the quality of their teaching:

P4: So, a lot of lecturers we have from outside are optometrists so they've effective teaching methodologies because they are more specialists on the optometry area while the national lectures are not specialists in optometry, they are general doctors.

P2: So, this discrepancy of methodology I think it's because of the area of specialisation because if we see that a general doctor is not specialist on optometry. And in the same way a professional optometrist is not

professional as a general doctor. So, the area of specialisation contributes a lot.

Besides the challenge of inculcating university institutions among the students and teaching staff, the university also had to inculcate these institutions among the administrative staff at the lower levels of the organisation. One member of the management team complained about staff not being motivated and not working when there was no direct supervision:

UniUS Management 2 said that they were really busy trying to finish work. He was trying to get things done before the December holidays...He said that the problem he had was that he knew that people just wouldn't do anything while he's away. He would return and nothing would be done. I asked if he was referring to the admin staff and he said that he was. He said that it was a mind-set that was difficult to change. He could put all of the plans ready but they just wouldn't do the work unless he was there to see that it gets done.

This complaint was also reported by some of the expatriate teaching staff and expatriates employed by international NGOs managing development projects in the region.

Leadership at the university was identified as essential for the development of university institutions among staff and students:

UniUS Management 2: Sharing ideas is very good...Communicate. That's important. That means working as a team...we have a very good Chancellor, [for that matter]. He likes to share ideas...The Vice-Chancellor, he doesn't take any high decision without consulting the Directors. Never.

The Rector (Vice-Chancellor) thus fashioned desirable behaviour. He was also very accommodating to me as a visiting researcher/student. In the few times that I had met him, he introduced me to staff, pointing out who spoke English so that I knew with whom I could communicate with ease. He also invited me to an event that showcased the work of the students in the Department of Architecture at which he introduced me to those in attendance, translating part of his speech to English for my benefit. The Rector was well-respected among management and the teaching staff, who addressed him as 'Magnifico' rather than by name.

He held symbolic power at the university and thus was influential among members of the university community.

The above discussion describes the struggles of the students and staff at the university in establishing it as a legitimate institution in the local and global contexts. It is clear that this was no small feat, especially for a young university. This was verbalised by a key actor at the university:

UniUS Management 2: It's not easy. You know, I used to say that we are 24 hours alert at what is happening...we have to be ready to help anyone, students, lecturers, at this moment because we are building a thing, you know.

The strategies that key actors employed in establishing the university were, however, also hindered by challenges presented by the socio-economic context, as discussed below.

4.4.6 Limitations related to the context

One major limitation that impacted on teaching and learning at the university was the lack of reliable access to the internet and the lack of books, in general, and books in Portuguese, especially. Implementing internationally-recognised education models that emphasised research was thus not appropriate. One of the lecturers stated:

Optometry Lecturer 6: Er, this year we had one [workshop] in the beginning. I thought [it] was very, very good. They talked...[about a] pedagogical [model], that was implemented in Columbia, the APB. But the problem with the APB is that we don't have research in terms of research

The lecturer quoted above continued to explain why implementing some international pedagogy models may be problematic in the local context:

Optometry Lecturer 6: I have, er, many subjects that I say to them [the students], 'OK, go to the library and research this'. But I know that maybe they don't have any books that talks about that or maybe the books that they have [are] in English...And maybe if I say to them, 'OK, look [at] the internet', maybe, you know that there are some months...without internet. And in the, maybe the rooms of the computers, it's not open all day, just

few hours...We, we would like to implement all the pedagogical things from the rest of the world, but for this context, for this moment, sometimes it's not working...

The library at the old university was about the same size as the classrooms, which were only big enough to accommodate about 20 to 30 students. Since there were only few books available, students were not allowed to take books out of the library except to photocopy parts of the books. The students complained about the lack of these resources:

P1(6th): ...computers are very few. And even [of] that [small] number of computers which exist, some computers are broken. And the wireless also, can only get access to those students who've got the laptop but not all of them also have got access to the password...Normally those are the students who understand better about computers so they've got their own ways to search and find the password.

A lack of reliable access to the internet and books also meant that the teaching staff did not have access to these resources in preparing for teaching and for conducting research, unless they had access to private resources. The optometry lecturers reported being constrained by the limited research facilities (interviews with two of the optometry lecturers).

There were plans in place to improve the Information Technology (IT) infrastructure at the university. They had the expertise, but a major obstacle was the lack of funds to establish the infrastructure. One of the main aims of the plan was to link the university campuses located in three provinces in the North and the hospital, where students received practical training, to an internal network. They had planned to present these ideas at a meeting of the External Advisory Board Meeting of the Medical Education Partnership Initiative (MEPI) in Johannesburg to request funding. There were also plans in place to link universities in Mozambique through a virtual network by linking into an international consortium, Missouri Research and Education Network (MOREnet).

Another obstacle to conducting research was the expense of licenced software. The university worked around this obstacle by opting for open source software, where possible. For example, they used to buy SPSS educational licences, which cost the university about 30 000 US dollars for 19 one-year licences. They later switched to using an open source statistics programme

called EPINF, which they found worked just as well. Open source software could also be upgraded regularly at no cost, minimising the occurrence of problems due to viruses.

Much has been written about the constraints that intellectual property laws have on development in Africa, and the opportunities that open access software can play in this regard (e.g. Bruggink, 2003; May, 2006). According to May (2006: 124), '...open source may partly reflect a post-development perspective that suggests economic and social change must flow from the communities themselves, not from some external source'. In this sense, the open source movement provides citizens and decision-makers in lower-income countries with capabilities to better drive their own development. Using open-source software does, however, depend on reliable access to the internet and staff trained in the application of open-software, which are conditions that are often not satisfied in sub-Saharan Africa (Bruggink, 2003). UniUS did, however, have well-trained staff managing the IT department, and access to the internet was becoming more reliable as additional cables were being laid to improve internet quality in the region. Another problem is the fact that some formats produced by open-source software are incompatible with proprietary software, which presents problems in sharing files.

4.5 Serving needs of society through networks

Universities increasingly collaborate with other collective actors in responding to the pressure they face to serve the needs of the stakeholders in their local contexts and the global economy (Brundenius et al, 2008; Gumport, 2007; Peterson, 2007). Stakeholders include students, the state, civil society organisations, local communities and commercial enterprises (firms and farmers). UniUS utilised a strategy of collaborating with other collective actors in order to benefit from the pooling of resources and lending on complementary assets possessed by other actors.

The university also borrowed social capital from local leaders in order to gain access to the local communities and promote their agenda of improving enrolment in education, and the use of modern professional expertise when it was more effective. This is discussed next, followed by a discussion on the role of the university in agriculture and the role of aid in helping the university to achieve its goals.

4.5.1 Interaction with local communities

Communicating with members of the local communities and trying to convince them of the importance of schooling, including primary, secondary and tertiary education, was not simple and straightforward even for the high-level decision makers at the university, who were all from Mozambique. The university often communicated with local communities, especially rural communities, via the leaders of the community. This strategy is reported to be effective because the leaders would be closer to the residents and would be respected by the community. Also, community leaders usually spoke the local (tribal) languages, which university representatives may not be able to speak. They were thus best able to reach community members to convey the message of the university and encourage people to embrace change and send their children to school. One of the members at the level of management at the university reported:

UniUS Management 2: Sometimes...when we do those trips, we talk to the...Chief [of the] Community. We talk to them because they have power. They have the power to convince other people of the village to listen [to] the message. And then, sometimes they have to talk using the local language.

This is an example of how the management at UniUS drew on social capital held by community leaders in order to convey their message to members of the local communities. They relied on those holding symbolic power in the communities they visited. Through this strategy, the management at the university also showed respect for cultural practices in the local communities rather than being perceived as imposing their values on community members. This is a strategy of impression management so that the university could be favourably received by the local communities whose needs it claimed to serve. The social skill of the key actors involved in managing the university were thus pivotal for establishing the university as a legitimate organisation in the local context.

The university also had a formal agreement with the central hospital in the province, a Memorandum of Understanding (MoU), which involved staff at the hospital teaching at the university, and students in some of the health sciences programmes completing the practical training component of their programme under the supervision of staff at the hospital. The hospital also utilised some of the specialised equipment (e.g. optometry equipment) at the

university (Interview with Ophthalmologist 1). Through such ties in the local context, the university was better able to produce graduates with the skills appropriate for practising as professionals in the context.

4.5.2 Serving the needs of farmers

One example of how the university served the needs of farmers in the local context is the role that the biotechnology laboratory played in the local peanut industry. The information reported in this section was obtained mainly via an interview with one of the individuals responsible for managing the biotechnology laboratory. The laboratory was managed by two people (one senior and one junior), who were supported by two technicians. It was based at the university in a room similar in size to the training room used for the optometry programme. The equipment did not look as high-tech as the equipment used for practical training in the optometry programme.

The biggest producers of peanuts are located in the northern region of Mozambique and they have recently been successful in the international market, with peanuts from Mozambique being sold at large supermarkets in the United Kingdom (e.g. Tesco) (Interview with OtherNGO 1). In order for local farmers to export peanuts they have to ensure that the produce satisfies export standards. Since peanuts are prone to being affected by a fungus called aflatoxin, it is important for the farmers to have their produce tested for the fungus before attempting to export it. The farmers provided the laboratory with a sample of peanuts to test. If the samples were found to be free of the fungus, the laboratory gave the farmers a certificate confirming this result. The farmers could then produce that certificate in their dealings with their customers. International customers would, however, also conduct their own tests. Before the laboratory was established, farmers had to send their peanut samples to South Africa for testing, which was costly. Through the laboratory, the university thus provided an essential service at a relatively low cost to the farmers, and in this way, supported their efforts for exporting their produce.

The university was not, however, able to control how the farmers utilised the certificate of quality provided by them. For instance, they found out that some of the farmers actually mixed peanuts affected by the fungus with those shown to be free of the fungus.

What this example also indicates is the lack of local expertise for repairing specialised equipment. The university experienced the same problem with the optometry equipment provided by OptomNGO. Two members of high-level management at the university reported the importance of being able to collaborate with local companies and/or multinational companies in order to ensure that they could source expertise locally in the North to repair the machines. Multinational companies were targeted as well as they may be interested in investing in the local market developed by the university. One of these key actors stated:

UniUS Management 2: And the next step for us, we can't wait for NEuro to do that for us, is to provide, to work with some companies to find companies in Mozambique in a way to ensure the maintenance of equipment...Er, companies who sell microscopes, sort of, they are franchising companies who are in Mozambique, probably with foreign capital. We have to work with those companies, not only thinking, because suppose that we have a problem with some microscopes or some tables or some chairs, you know, those are very specific chairs for, you know.

The university was also considering collaborating with the private sector in developing a private teaching clinic that would benefit them by providing facilities for training the students and in producing extra funds for the university to use to sustain itself (Interviews, UniUS Management 1 and DNO Core Management 2). It was thus considered an opportunity for social business. Public-private partnerships do, however, present some challenges, for example, establishing the ownership rights of an organisation built on public land (Interview, DNO Core Management 2).

4.5.3 Accelerating STI-capacity development through aid-funded projects

In the field, management at UniUS identified the lack of government funding for the university as a major constraint. One of the strategic actors at UniUS described the situation as being expected to 'make omelettes without eggs':

UniUS Management 2: ...omelettes without eggs. Sometimes we are called to do that. There is no another way to do it, otherwise we'll be waiting days, weeks, months...We have to have a good will of people who work there [at the African university] otherwise it's impossible...Not only waiting for ideal conditions. We will never have that enough, never.

As indicated above, the university relied on access to external funding to supplement the state funding that they received, which was reported to be insufficient for covering the day-to-day costs of running the university and building the physical infrastructure. As one member of the management team stated:

UniUS Management 2: ...the condition that Mozambique has in this moment...all the aid is helpful, is welcome. And, because Mozambique is a very poor country, er, that means all the universities, all the institutions, education institutions [are] in need of money. OK. Because, without money, it's very difficult. We can do it but it's very difficult to have a very good education with quality.

Besides the facilities for the optometry department provided with the help of aid-funding, there were other facilities at the university that were also established with the help of aid-agencies. One example is the biotechnology laboratory, which provided services for farmers and farmer associations. The equipment used in the laboratory was donated by two international funding agencies. However, when the machine broke, it had to be sent to a biotechnology centre in South Africa. At the time of conducting the field work, the manager of the laboratory was also in South Africa receiving training, which indicates reliance on external actors for training opportunities.

The role of aid in developing capacity for STI in the region is further illustrated by the analysis of the ways in which other projects funded under the DevAid Programme of Collaboration (PCHE) contributed to capacity development in the region.

4.6 The role of the 'Northern' universities in aid-funded development

The DevAid Programme was introduced in order to engage universities (and higher education institutions, more generally) in NEuro in the field of development, in a more systematic way. They would assist DevAid in achieving its development goals (Interviews, DevAid, HEA, and the projects' key contacts). In this instance, the state (through DevAid) became a client of the universities as well, which is a growing trend in the current economy (see Peterson, 2007). In the field of development in sub-Saharan Africa, the 'Northern' universities thus supported DevAid's development goals and development goals in the African countries.

The projects funded under the DevAid Programme had a diverse set of objectives. But the most common way in which the universities contributed to capacity development was through the production of PhD graduates. In this way, they also supported research on the local context, which is much needed in Africa. One of the key actors at DevAid, who is involved in the management of the programme, stated:

DevAid 1: Well, what I would say to you is that what the projects have ended up, the activities they've ended up doing are funding PhDs. Um, I think now, is there 34 or maybe 40, can't remember, maybe 43 PhDs being funded across all the projects. It's a lot...That's how they've, that's how universities understand, very often to be building capacity.

DevAid was not, however, completely content with this emphasis:

DevAid 1: But there could've been an element of mentoring. There could've been, er, joint teaching. There could've been and there are, there is action research, you know.

While DevAid agreed with the need to produce PhD graduates who are African, they indicated that there was a mismatch between their needs as development practitioners and academics at the universities involved in the programme. As development practitioners, DevAid prioritised activities that had more direct impact and that showed high impact in a short period of time. PhD research was costly and long-term. Due to the results-driven approach of development practice, they had to be accountable to the public and were under pressure to show impact in order to establish their legitimacy for continuing their development activities (see also Mosse, 2005, for example). The mismatch between the approach of DevAid and academia was also often discussed at debates, seminars and meetings organised as part of the projects' activities. This is an example of how development policy is shaped and transformed by actors carrying out development projects (see Mosse, 2005).

Some of the African academics were also not content with the focus on producing PhDs. In two of the projects, the academics based at the African universities complained about the projects not providing them with funding to do their own research (Participant observation at Project 1's workshop; interview with a member of Project 3).

The projects used several different models for producing PhDs. The model most commonly used was to recruit students from the local country contexts, usually through their partner organisations in Africa, and arrange for the students to receive a degree from NEuro universities. The students received scholarships covering their tuition fees, study resources and research, and included a stipend to cover their living costs. All of the PhD students interviewed reported that the funding was more than sufficient to support them during their studies. The only complaint that they had was that the stipend they received was reduced for the period in which they spent conducting field work in their home countries because of the perception that things are cheaper in Africa. The students reported that while some things were cheaper (e.g. food), other things were more expensive (e.g. safe transport to rural communities). With this model, the students spent some time at the university at which they were registered in NEuro and (in most cases) conducted field work for their research in their home countries. A model that the MozOptom DNO used also involved the students being registered at a university in NEuro, but the students almost never travelled to NEuro and did not receive any funding besides the funding for their research and tuition fees. Developing joint degree programmes between universities in Africa and Europe was identified as preferable, but problematic.

Most of time, the NEuro universities involved in the projects waived the full fee or EU-equivalent of the students' tuition fees. This practice did, however, differ according to whether the students were registered at the older, more well-established traditional universities or the other types of universities (i.e. institutes of technology and university colleges). The latter showed greater flexibility in supporting the development objectives of the projects. In the case of NEuroIT, they waived students' tuition fees in order to make their proposals for funding more attractive to DevAid (see Chapter 5).

A few of the projects offered short-term training for students and young researchers at partner organisations in Africa rather than supporting PhD research. In this way, they addressed the need for skilled personnel and research in a different way.

The extent to which the model of producing PhD graduates contributed to development with sustained outcomes in Africa hinged on whether the students returned to Africa for work instead of remaining in Europe. Only one of the PhD students interviewed reported preference for remaining in Europe. Most of the students were married and had children, and

some held permanent posts at universities back home. These students indicated that they intended to return to their home countries.

They also reported that the PhD would be immensely helpful with regard to job opportunities back home as having a PhD increased their status and thus attractiveness in the job market. They would also benefit from the ties that they developed through their involvement in the projects. One of the PhD students described the usefulness of the contacts he had made at the NEuro university where he was registered:

PhD Student Project 4: Er, I think the network is not only about getting PhD, but making contacts, new friends, people you'd work with. So, I don't see myself stopping at PhD. I'll have so many contacts. There are so many colleagues here who are interested to do research in Africa. So that's an opportunity...I hope, by the time I finish my PhD we may have a project that we can, er, jointly implement...I'll also be accessing some literature from here until, probably, we can secure some hefty funding so that we can facilitate access to literature through journal subscription.

This PhD student identified the instrumentality of the social networks that he developed during the course of the PhD, which he planned to maintain after his PhD studies as sources of expertise and resources. This is an example of how development networks are utilised as mechanisms for accelerating STI-capacity development (funding PhDs), and through which information and other resources that are not easily available in the local context, can be accessed.

One of the projects also offered direct services to partner organisations in Africa. For example, one project sent IT technicians from NEuro to their partner organisations in Africa to build their IT infrastructure in order to improve the African organisations' capacity for actively engaging in project activities and communicating with partner organisations.

4.7 Conclusion

In this chapter, I discussed how the education system, specifically 'the university', in Mozambique acts as an instrument through which communities are being transformed through modernisation. Globally, universities are treated as one of the key instruments of modernity (Larson, 1977). Much of the focus in policy, and in the literature, has been on the role of universities (globally and in Africa) in economic development through engaging in

commercial ventures, with less attention being given to the role of universities in social change, specifically cultural development (see Cloete et al, 2011; de la Harpe and van Zyl, 2012). This chapter shows that UniUS plays a much greater role in cultural development in the local context, which has not been given much attention in the sociology of higher education literature (see Meyer et al, 2007). Hence, in agreement with DiMaggio (2011: 287), I argue that universities are institutionalised fields of 'cultural production' (see also Clark, 1973; Cowen, 2007; Meyer et al, 2007).

The discussion in this chapter shows the usefulness of a network-institutional approach to analysing the role of universities in economic and social development. This approach highlighted the role of UniUS in producing much needed skilled human capital as well as the university's role as a modernising agent, producing and reproducing institutions considered essential for development (e.g. importance of education, social capabilities, etc.). As a young university, the elites at UniUS had to negotiate with the elites in the local communities to establish their legitimacy. The challenges UniUS faced are similar to that faced by other universities globally that are dealing with increasing diversity of their student populations in terms of religious and educational diversity. Universities globally are thus faced with the challenges of addressing the effects of poor quality pre-university schooling and inculcating standardised modern institutions, while accommodating cultural and religious differences (Meyer et al, 2007; Antonio and Muniz, 2007).

UniUS formed ties with a host of different stakeholders (e.g. farmers, community leaders, etc.) in order to better serve the needs of the local context. UniUS often linked into new social networks, and formed new linkages in order to access funding and other physical resources as well as social capital. The strategy of using networks as mechanisms for accessing useful resources (e.g. social capital, funding) and supporting UniUS in meeting the needs of and driving development in the local context is investigated in greater depth in the next chapter. The next chapter shows how UniUS utilises the MozOptom DNO as a mechanism through which it can obtain the funding, and physical and human resources for expanding the university (i.e. developing capacity at the university), and develop optometry-related science, technology and innovation (STI) capacity in the local context.

How do the main educational model adopted by the university, the university institutions (e.g. dealing with traditional local institutions), and the limitations and challenges of the local

context shape the activities of the MozOptom DNO? This question is addressed in the next chapter. It is a particularly important question considering that one of the main activities of the DNO is the implementation of a curriculum developed outside of the local context (i.e. the context of the Northern region of Mozambique).

Chapter 5 Transforming the field of eye care in Mozambique: developing the optometry professional project

In this thesis, I explore the role of the MozOptom DNO in developing optometry-related STI capacity in Northern Mozambique. Development network organisations (DNOs) are one of the mechanisms that African universities, like UniUS, employ in accessing resources not easily accessible in the local context (see Chapter 4). Drawing on a network-institutional approach to the analysis, I conceptualise DNOs as mesolevel social orders through which resources are transmitted and strategic action for social change takes place. From a neo-institutionalist perspective, DNOs are fields embedded in fields (Fligstein, 2001; Fligstein and McAdam's, 2012) or a complex web of social networks (Padgett and Powell, 2012). In this chapter, the focus of the analysis is the role of the MozOptom DNO in transforming the field of eye care in Mozambique in order to establish the optometry profession in the country (see Figure 7 below). The focus is thus on the emergence of the field of optometry in Mozambique and the role of the MozOptom DNO in the process.

5.1 Producing the optometry training programme – a field within fields

The multilevel approach to the analysis and the different state and inter-dependent fields in which the MozOptom DNO is embedded, are illustrated in Figure 7. This chapter focuses on the process by which the optometry school was produced in the field of UniUS (and the higher education sector) in Mozambique. From a social constructionist perspective, new social technologies, like the optometry school, are co-produced by a set of social groups (including users and producers), who work to produce and reproduce it. 'Stabilisation' of the social technology occurs through a process of establishing consensus among the relevant dominant social groups, marginalising any critiques (i.e. a process of 'closure') (Pinch and Bijker, 1987: 44). According to Pinch and Bijker (1987: 46), 'the sociocultural and political situation of a social group shapes its norms and values which in turn influence the meaning given to an artefact'.

In this chapter, I explore the different meanings that the relevant social groups – that is, actors at OptomNGO, NEuroIT, UniUS and the dominant players in the field of eye care Mozambique – give to the newly established optometry school.

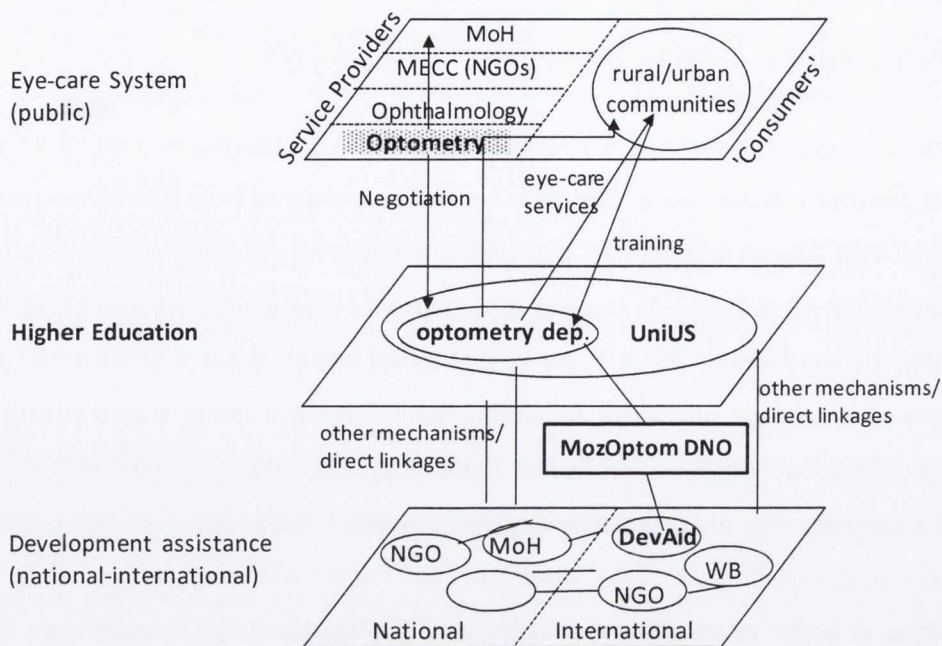


Figure 7 MozOptom DNO and the fields within which it is embedded

Note: 'Optometry' is shaded over as the optometry profession has not been officially recognised by the Ministry of Health in Mozambique.

I also analyse the development of the optometry professional community in Mozambique as a 'cultural production system' (DiMaggio, 2011: 287) through which professional formal and tacit knowledge (institutions) is produced and reproduced in the field of eye care and higher education in Mozambique. I draw on key ideas in the sociology of professions literature, especially the notion of 'the professional project' (Larson, 1977), in exploring the development of the professional community. It is important to note that the focus is not on the question of the legitimacy of optometry as a profession or defining what optometrists in Mozambique do or should be doing, which are general issues (related to professions) that have been given much attention in the sociology of professions literature (e.g. Macdonald, 1995; Larson, 1977). Rather, the focus of the analysis is on the role of the MozOptom DNO in the process of developing the profession, specifically the challenges encountered and the strategies employed for overcoming these challenges. The network strategy utilised by the MozOptom DNO is discussed next, followed by a discussion of the development of the professional community and the role of technology (ICTs and specialised equipment) in supporting the 'professional project'.

The data analysed in this chapter includes the qualitative data on the MozOptom DNO and the survey data on the use of technology for project-related activities, which is the most comprehensive data that I collected on the importance of technology in supporting project activities.

5.2 Developing social networks for supporting the professional project of optometry

According to Larson's (1977) theory of the professions, three assets are important for the production and reproduction of a profession or 'the professional project': 1) economic assets (e.g. buildings, capital, furnishing, etc.), 2) organisational assets (e.g. organisational rules), and 3) cultural or institutional assets (e.g. norms for those involved in the profession) (see also Macdonald, 1995). Each of these assets is important for establishing the legitimacy and respectability of the profession in the social context, which professional communities desire in order to produce and reproduce the community.

A key issue that emerged from the data is the challenge of developing the optometry profession in a low-income country context with limited financial resources, and a lack of physical capital (e.g. optometry equipment for the training), human capital (local expertise) and social capital (e.g. community of professional optometrists, shared institutions, etc.) (as discussed in Chapter 4). Additional challenges include the fact that the field of eye care in Mozambique is dominated and controlled by members of a traditionally rival profession, ophthalmology, and there was no optometry professional community that could support the efforts of the MozOptom DNO (see Chapter 2 for a description of the field of eye care globally and in Mozambique). The MozOptom DNO thus had to negotiate with the state and the elites controlling the eye care system, and vie for access and control of resources (specifically, human resources and jobs in the public sector).

It is apparent from the strategy followed by the MozOptom DNO that they recognised the need to focus on all levels of the 'professional project' – that is, developing physical resources, human capital and social capital, and creating a favourable policy environment – in laying the building blocks for the development of professional expertise in Mozambique. A manager at OptomNGO pointed out the logic of taking a more comprehensive approach to developing capacity:

OptomNGO Staff 2: So, essentially, if we go into a country like Mozambique, if, you know, if there's no personnel, HR, in place, it's pointless setting up a clinic, etc. So, we would start from the beginning of setting up an optometry school, training the relevant HR personnel, then putting the infrastructure in place to provide the service...So, the next step is also once you have the services available and the critical thing, especially in developing countries, is that the product is not available in terms of your spectacles, um, even some of your optometry equipment, etc.

From the very beginning of the MozOptom DNO, the strategy of linking into existing social networks or forming new social networks, where necessary, was utilised. The DevAid Programme, which emphasised the role of higher education institutions (HEIs) in NEuro and DevAid priority countries, provided the opportunity to gain access to the financial resources necessary to start the professional project of optometry in Mozambique. The MozOptom DNO was formed as a way of gaining access to the DevAid funds and to benefit from the complementarity of assets and pooling of resources, which are advantages of network organisational structures. As discussed in detail in Chapter 7, each of the organisations held a specific set of skills that was needed for the 'professional project':

- OptomNGO had experience in implementing optometry training programmes in different countries in Africa and other low-income regions, and it was well-connected in the field of optometry, especially in Africa;
- UniUS was located in a region where the need for optometry was identified and could thus provide expertise in running degree programmes in the context and could contribute through providing knowledge of the context as well as the physical space and furnishings for the training programme;
- NEuroIT (i.e. the lead institution) had expertise in optometry training and was well-positioned to gain access to DevAid and liaise with DevAid with regard to the funding and co-ordination of the project; and
- NEuroUni (i.e. a well-established traditional research university), which only played a peripheral role in the project, held expertise in research in the area of optometry and thus was useful for supporting the research that was mainly conducted by the PhD students whose studies were funded by the project.

Each of the organisations thus contributed to the 'professional project' and they relied on each other for achieving the goals of their own 'development projects' and the common goals of the MozOptom DNO. Since this will be discussed in great detail later, it will not be given much attention in this chapter. Besides relying on each other, the MozOptom DNO also relied on the social networks to which each of the organisations were linked and the social networks established in the field of eye care in Mozambique.

5.3 Developing the optometry professional 'community'

An essential element of the 'professional project' is the 'professional community', which refers to the group of individuals who hold the shared minimum required codified knowledge, shared institutions, and shared identity (Larson, 1977; Macdonald, 1995). Shared identity and shared meanings are important characteristics of fields (see Fligstein and McAdam, 2012; Padgett and Powell, 2012). Professional communities typically include 'professional associations, professional schools, and self-administered code of ethics' (Larson, 1977: x). The minimum level of formal (theoretical and practical) knowledge required and social capital are developed, and are continuously reproduced through professional associations and professional schools. The professional code of ethics is usually produced and administered (and reproduced) through these bodies. These bodies are themselves produced and managed by elites in the professional community. Some authors have used the term 'cultural assets' in referring to the institutions of professions (e.g. Macdonald, 1995), which form part of the social capital of professions. According to Macdonald (1995), 'cultural assets' are the most crucial elements of the 'professional project' as they are necessary for establishing and maintaining the legitimacy and respectability of the professional community. Through socialisation, individuals entering the professional community internalise the norms and values (institutions) of the profession, with trust between the client and the professional being of foremost importance. This process is referred to as the process of professionalisation. Individuals develop a professional identity, which is essential for their commitment to the professional community.

Universities (and other types of professional schools) play a pivotal role in the professionalisation process and are thus central to the professional project (Freidson, 1986; Larson, 1977; Macdonald, 1995). Universities provide tools for learning, but also opportunities for the production and dissemination of research, which is essential for keeping up-to-date with developments in the field (Faucher, 2011). Research also contributes to the legitimacy of

the profession as it showcases work done in the field and evidence of the necessary role played by the profession.

According to Faucher (2011: 218), the development of expertise has 'never been investigated in optometry'. Faucher (2011: 218) refers to the development of expertise as the 'gradual transition from novice to expert within a profession', which involves university education leading to a degree as well as 'the evolution of a professional throughout one's practice'. The present study addresses this gap in the literature in contributing to the understanding of the emergence of the optometry profession in a low-income country context.

Developing a professional school for optometry was identified by OptomNGO as a necessary starting point for developing optometry capacity. The MozOptom DNO was formed for this purpose. In the next section, the development of the professional community, which includes the producers of professionals (Larson, 1977) and the professionals providing optometry services in the public and private sector, is discussed. The focus is on the essential elements for creating the professional school, identified by members of the MozOptom DNO: an appropriate curriculum, qualified lecturers, students and equipment for the practical training.

5.3.1 'Optometry in a box' – implementing a global optometry curriculum

Members of the MozOptom DNO based at OptomNGO referred to the curriculum as 'a global optometry curriculum'. A key member based in NEuro also referred to it as 'optometry in a box' and as a 'side project' (see quotes below). The impetus for developing a global curriculum is the lack of financial resources and skilled human resources for training in optometry in sub-Saharan Africa. It is argued, by the key actors at OptomNGO and NEuroIT, that having a standardised set of teaching materials would reduce the amount of time needed to prepare for teaching and ensure that students are taught an internationally recognised curriculum. The substance of the optometry training was developed and co-ordinated by OptomNGO, as part of their 'development project' (Long, 2001), to produce a 'multiple entry and exit' training model. The multi-exit model is an educational innovation of the Director of OptomNGO that could be implemented in different counties in sub-Saharan Africa with limited or no optometry capacity. Successful implementation of such a model would enhance the status and legitimacy of OptomNGO in the field of eye care, especially eye care in 'developing countries'. A key member based at OptomNGO described the curriculum:

DNO Executive Management 1: We have developed a global optometry curriculum that...will be used in Mali, Gambia, Uganda will use it, Cameroon soon. Er, we wanna open in Zimbabwe...in each country you'll find that some changes are done to it. So, there's no one size fits all.

The model was designed to facilitate the production of different cadres of professionals exiting the programme at different points in the programme. The idea behind this model is to equip the eye care system with different levels of expertise in order to serve the different needs of the system. The curriculum had to have some level of standardisation to facilitate implementation in different contexts. Basically, the global curriculum includes the teaching materials that lecturers are expected to utilise in teaching the course, including PowerPoint presentations and course notes. The course notes would be given to the students as study materials.

The tools used to develop the standardised teaching materials were sourced from optometry and ophthalmology professionals worldwide, who agreed to allow their resources to be used for the purposes of training in developing countries on a not-for-profit basis. The project members at OptomNGO depended on their existing social networks for sourcing the materials. This procedure was described by a key project member based in NEuro:

DNO Core Management 1: And the person in charge of that is (the Director of Human Resources at OptomNGO) and basically he's an Italian-Canadian optometrist who has links all over the world and he's just called in favours and e-mailed people and asked them for whatever they had...He has one part-time member of staff...helping him co-ordinate and put the notes together...and put them into the one format...

Although the teaching materials were generally standardised across the countries where OptomNGO developed optometry schools, the curriculum in the different countries and the training models were not exactly the same. As indicated in the quote above, 'there's no one size fits all' (Interview, DNO Executive Management 1). In the Mozambican context, the multiple entry and exit model on which the concept of the global curriculum was based, could not be implemented. Education Law in Mozambique changed in 2010. The university could not, by law, produce graduates below degree-level qualification (see Chapter 4). Also, before the global curriculum was implemented in Mozambique, the university had already adopted

and adapted a curriculum utilised in Malawi. They had obtained formal approval for the course, including the curriculum, during the first year of the project. The key members at OptomNGO and NEuroIT later advised that the curriculum be revised to bring it in line with the global curriculum that OptomNGO was producing, which would be internationally recognised. In Mozambique, a curriculum that has already been approved by the University Council could not be replaced for five years, but could be adapted. Management at UniUS was open to the revision. A key member of the management team at UniUS stated:

UniUS Management 2: ...the curriculum we have, it has been proved, approved with University Council three years ago, OK, and we are following that. What NEuro did was to readjust the programme and we are happy with that.

Adaptations to the curriculum, suggested by OptomNGO (in consultation with NEuroIT), included the addition of subjects and changes to the stage at which some subjects were taught. A key member of the teaching team provided the example of the addition of biology to the curriculum. This member explained that the quality of education in Mozambique was poor and so, it was important for them to firstly provide the students with a good foundation in science subjects, like biology, before they could go on to learning higher level subjects, like microbiology (see Chapter 4). Another adaptation was the inclusion of courses related to public health, a research component in the final year, and a greater emphasis on practical training so that the students start their practical training relatively early in their studies. According to a core member of the teaching team, the optometry programme was the only degree programme at UniUS that included a research component. A core member involved in the development of the global curriculum stated:

DNO Executive Management 1: We've brought, well, we brought in more public health and stuff. But we've reengineered courses to be more relevant to the developing world. OK. And then the curriculum is put in a way that allows certain skills to be achieved within a certain time and then separate other skills out, which is not normally the way optometry curriculums, er, develop. But I have to be very clear, it's not like we developed new courses. I mean, anatomy is anatomy, you know...

Hence, with a greater emphasis on a learning-by-doing mode of learning, the curriculum places less emphasis on theory in basic science that is not directly relevant for practising optometrists. The core member quoted above continued to explain:

DNO Executive Management 1: We brought in new content...not teaching people so much high level physics that has no relevance to the reality. I mean, universities claim it's about quality, but it's not...I studied a whole lot of stuff at university because they wanted to put 500 people with different career paths into the same class, you know... and because a lot of these courses need to survive.

The quote above indicates the philosophical background to the curriculum, which was more geared towards providing knowledge and practical training considered relevant for low-income contexts in Africa. Hence, emphasis was on producing optometry professionals who could respond to the immediate needs of the context. The core actors at each of the main organisations, that are part of the MozOptom DNO, stressed the importance for development initiatives to have sustained outcomes and the role of developing indigenous capacity for this. They also identified the need to recognise that health care was linked to social development and economic growth, with both linked to poverty. This definition of development is increasingly recognised in the international development community, following Amartya Sen's 'capability approach' (see UNDP, 2010). The curriculum thus includes modules on global health, development and the economics of eye care (Interview, DNO Executive Management 1 and DNO Core Management 4).

Although the curriculum was a product of OptomNGO as part of their global optometry curriculum 'project', it was in line with the vision of UniUS, where the curriculum was implemented. As indicated earlier, management at UniUS recognised their limitations in developing an internationally recognised optometry curriculum and was thus content with the curriculum they implemented initially being adapted by more qualified members of the DNO. The key actors at OptomNGO and NEuroIT also recognised UniUS's expertise in addressing needs of the local context. This can best be seen by their promotion of the university's 'One Student One Family' programme, which was a compulsory module for all students in the Health Sciences faculty. The 'One Student One Family' programme was created in consultation with local community leaders and NGOs. The aim of the programme, as stated in the policy document of the programme (2009: 2) is:

...to put students in direct contact with the community and the university to interact with society, so that future graduates, in addition to theoretical knowledge, acquire also the practice based on the reality of the country and community needs.

The Network Co-ordinator of the MozOptom DNO reported, 'The One Student One Family programme allows community focused optometrists to be trained. This is one of the main objectives of the (MozOptom DNO)' (conference presentation by the Network Manager). The programme is referred to as 'a fantastic example of community engagement' on the MozOptom DNO's Facebook page. Also indicating the importance that the MozOptom DNO placed on the programme in meeting its common goals is the fact that a core member affiliated with OptomNGO presented a paper on the project in relation to the MozOptom DNO's training activities at a conference on university-community partnerships in Africa.

Hence, although the substance of the global optometry curriculum was developed according to the priorities of OptomNGO, the objectives of the curriculum were shared by UniUS and NEuroIT as well. While all were content with the substance, there were some problems in implementing the global curriculum. Those tasked with actually teaching the curriculum and overseeing its implementation in the context of UniUS in Tizangara, reported some problems.

One of the major problems reported was related to the fact that lecturers were not allowed to access the PowerPoint presentations they were expected to use for teaching, until they were formally contracted by the university and had signed a confidentiality agreement with OptomNGO. According to three of the core actors at OptomNGO and NEuroIT, acknowledging the contributions of the optometrists, who donated teaching materials for the global curriculum, and protecting their intellectual property, was part of their agreement with the donors of the teaching materials. As part of the agreement, OptomNGO could only utilise the material in their not-for-profit development projects. The confidentiality agreement prohibited sharing the materials with individuals not involved in OptomNGO's development projects and using the materials for other initiatives. One of the core actors explained:

DNO Core Management 1: ...they [the lecturers] sign a kind of confidentiality agreement, and so does the university, that the notes we give them will just be used in the university for this course and that they won't give them away to anyone else.

When asked why confidentiality agreements were necessary, the DNO member responded:

DNO Core Management 1: Um, because if, say if you are an optometry lecturer in (NEuro) and you've spent like two to three years working on your notes, working on your PowerPoints for whatever module and then you kind of give them to a charity, you don't want them to be sold by the charity or by the university to someone else or given to someone who you don't know because it's, um, you know, you're giving it on the premise that it's to be used for developing countries but once it gets into someone's hands, you never know what could happen to it.

OptomNGO thus provided the donors of the materials with a promise, a kind of copyright agreement, to prevent misuse of the materials donated for the global curriculum project. In this way, the confidentiality agreement served to encourage professionals to donate their teaching materials. In attending the optometry classes at the African university, I noticed that the PowerPoint slides that the lecturers used were marked with OptomNGO's logo. While this is understandable, the condition resulted in lecturers not being allowed to use the PowerPoints to prepare for teaching before they were formally contracted for the teaching posts and before they arrived in Tizangara to take up their posts. Since most of them arrived in Tizangara just a few days before starting to teach, they did not have much time to go through the teaching materials and prepare for teaching their classes (Interviews with Optometry Lecturer 1 and Optometry Lecturer 2).

The other core members based in Tizangara, who were responsible for co-ordinating project activities in Tizangara, were well aware of this situation. In order to prevent this problem from recurring, they allowed the lecturers who arrived subsequently (after the problem was reported) to access the teaching materials once they had accepted the job offer and plans were in place for them to travel to Tizangara to start teaching. This was before any confidentiality agreements were signed. Providing the lecturers with the teaching materials beforehand was considered particularly important by the core actors based in Tizangara because the new lecturers were less experienced and thus needed time to prepare. They also considered it important to provide them with information on the context and share their experiences of living and teaching in Tizangara in order to better prepare them for the experience.

The 'confidentiality agreement' that OptomNGO attached to the use of the teaching materials included in the global curriculum thus served to encourage experts to donate their teaching materials, but, at the same time, restricted use even to those it was supposed to benefit (i.e. the lecturers involved in their development initiatives). According to Benkler (2006: 36), arguments for attaching copyright agreements to information and cultural products (i.e. 'nonrival' goods) are flawed. He explains that since the inputs and outputs of these kinds of goods are the same, the reasoning for attaching copyright protection to them are weak because it would then make it costly to improve on them and create innovations based on them, which is an undesirable effect. In the case of the global curriculum, the 'confidentiality agreement' and standardisation of the materials restricted the extent to which the lecturers could engage with the material and improve on it or adapt it to the local context based on their experience (as expertise is an input to the development of a curriculum). As the findings presented here show, the restrictions on the use of the teaching materials not only limited innovation, but also may have weakened the quality of the teaching. The cost of the 'confidentiality agreement' attached to the teaching materials – that is, restrictions in innovation and adaptation of the teaching materials to the context, and thus weakened quality of teaching – seems to outweigh the benefit – encouraging donations to OptomNGO's 'global resource bank', which contained resources for developing the global curriculum.

Interestingly, OptomNGO also encountered restrictions in utilising the teaching materials donated by other eye-care professionals as some of them were copyright protected. They worked around this problem by opting to use materials (e.g. diagrams, photographs of the inside of the eye, etc.) that were not copyright protected instead or redrawing any diagrams that were copyright protected, as one core member reported:

DNO Core Management 1: ...you'd copy the picture or you'd look at it and you'd draw it again...or else you'd get a photograph that has consent for you to use it and there's no copyright on it.

Photographs and diagrams from OptomNGO's 'global (eye care education) resource bank' could then be included in the teaching materials. The fact that OptomNGO had a strategy for working around restrictions in access to the knowledge resources they required for developing the teaching materials further weakens their argument for attaching a 'confidentiality agreement' to the teaching materials included in the global curriculum.

Another problem pointed out by one of the core members, who was involved in co-ordinating project activities in Tizangara, is that many of the diagrams that included people were not contextualised. For example, during one of the informal lunchtime meetings of the DNO members based in Tizangara (excluding management at the university), one of the teaching staff indicated that she wanted assistance in obtaining drawings to be used by the students for the 'One Student One Family' programme. Another core member replied that OptomNGO would probably request that they utilise one of the drawings provided by their 'global resource centre' and that the problem with those drawings was that most of the people in them resembled 'Aborigines' ('native Australians'). This core member complained about this issue another time when we met a Mozambican man in the city, who was a local artist. This conversation was recorded in the field notes (27 May 2011):

(DNO Core Management 2) told me that the man was Mozambican, an artist. S/he told me that s/he suggested to the other project members that they hire the man to do the drawings for the optometry training programme that included people. That way Mozambicans could identify with the sketches. The project members didn't think it was a good idea as they already had sketches. (DNO Core Management 2) said that they didn't realise that since the sketches were from Australia, the people in the sketches looked like Aborigines.

The problem of insufficient attention to the specifics of the context was also a complaint by management at UniUS. Three of the five key DNO members at the level of management at UniUS indicated that they understood that the training programme was part of a pilot study on the implementation of a training model, but they felt that insufficient attention was given to the needs of the context. They complained about the fact that just about all of the teaching materials utilised in the beginning were in English. Two of the DNO members at the level of management at the university provided an example:

UniUS Management 2: We had one lecturer till, until this year who[se] presentations were, all of them in English, you know. She was Spanish but she had presentations, lessons, er, in English.

UniUS Management 4: (Interrupts) To teach students who speak Portuguese.

UniUS Management 2: ...Because she got that from NEuroIT she had to deliver the lesson in English. Can you imagine that?

In addition to this problem, the textbooks provided by the MozOptom DNO during the first year or so were also in English. The two actors, quoted above, added that the situation gave them the impression that NEuroIT and OptomNGO were more focused on the logistics of the project as part of the pilot study rather than on providing the students with the best quality education, which is their main priority as management of the university (i.e. their 'development project'). As discussed in detail in Chapters 7 and 8, this is one reason for the tension among the project members during the first three years or so of the project.

The students also pointed out the problem of lecturers using PowerPoint presentations in English and giving them course notes in English. The issue was revealed by students in the focus group discussions:

P3(6th): ...we spoke Portuguese and the tutors spoke Spanish and the material was written in English. So, initially, it was a bit complicated...But some teachers normally used to translate the material they used to give to us. So, I think in some way that helped us to understand.

P3(4thFG): I think it has improved now because last year it was just English. And we don't speak English. We can't read English. So, but I think with the translation something has improved although there are small problems with mistakes.

I: You mean, like the PowerPoints were in English? (Translator translates)

P3(4thFG): Yes, last year the PowerPoints were in English but now they are in Portuguese.

As indicated in the quote above, the MozOptom DNO only managed to get the teaching materials translated to Portuguese during the second year of teaching in optometry (minus the foundation year). The first group of students, in particular, were disadvantaged by this situation and reported in the focus groups that they felt despondent in the beginning, with many thinking of changing courses or dropping out because they did not feel assured of the

future of the course. The lack of resources available to the students at the beginning of the course was reported by some of the students:

P1: So, whenever we went to ask for information, whenever I wanted some material, nothing was available because we were just getting started. We had no books. We had no resources. So, it was a very difficult experience.

P3(6th): There was a lack of so many things and nobody knew about the course. So, there were questions but nobody could answer the questions.

In an attempt to make up for the lack of optometry resources (e.g. books, teachers) available to the students during the first year of the project, the Principal Investigator visited the university frequently and met with the students in order to provide them with information about optometry and respond to questions they had about the training programme. An 'introduction to optometry' module was added to the course when the second group of students enrolled for studies.

The fact that most of the students in the first group did not choose to study optometry, added to their frustration (as they discussed in the focus group discussions). All of the lecturers did, however, identify the dedication and enthusiasm of the students for learning as the most rewarding part of teaching in the programme. Two of the lecturers stated:

Optometry Lecturer 1: ...the students are really good compared to the European ones. They're really good...

Optometry Lecturer 2: (Interrupts) But they are good not because they are more intelligent. It's because they really want to learn.

Optometry Lecturer 1: Yah. They are good students. They are respectful. They study a lot, a lot...So, I believe they are going to be a really good professional.

The lecturers and students described the different ways in which they tried to compensate for the lack of resources (e.g. books) and the problem of having teaching materials in English. For example, the lecturers provided the students with notes that they translated. One of the students reported:

P1(6th): In principle, there were no books. The teachers used to bring hand outs. So, what they found to be relevant then they would translate and then we should launch a debate so that we could understand the lesson.

Only the course notes were given to the students as the PowerPoint slides were copyright protected and thus, access was restricted, as one of the students reported:

P2(dec): PowerPoint presentations they don't give us because they made it very clear that they are not allowed to give presentations on PowerPoint.

The students reported that there were some inaccuracies in translation in the hand outs they received:

P3(dec): Yes, [the course notes] it's very useful although it contains some errors because sometimes the translation is not quite clear, and we read based on that material for tests. So we hope that, something [you] need to improve on the translation because sometimes when we read for the test and then when we go to sit for the test then we see that we have given wrong answers because of the translation we read.

They compared the information provided in the course notes and books with other sources (e.g. internet, books) as a way of dealing with the problem of inaccuracies in translation:

P4(2nd): So, there are a lot of books in English and Spanish, so that's not very easy...Also, there are books that have been translated but they were wrongly translated...But also that happens in other courses...

I: OK. So, what do you, how [do you] handle that? How do you deal with that?

P2(2nd): We normally make a comparison. So, we get information from the internet, we get information from other books and then we compare so that we see the difference. But I think that problem now has been overcome because now we received a number of books for our course.

Since the classes are quite small (maximum of 26), the students also formed strong bonds and helped each other, as indicated by two of the lecturers:

Optometry Lecturer 1: ...they're really friends, to care for each other.

Optometry Lecturer 2: One student will teach the other for the other to understand. And they do help a lot among them. And with me it's funny because I don't speak good Portuguese. When I'm explaining something, if somebody doesn't understand, somebody will come up and say, OK, I'll tell you how I understand the thing. And they will explain everything in Portuguese.

So, the lecturers and students had a flexible attitude, and they worked together to overcome the challenges presented by the lack of books and course materials in Portuguese, and the language gap between the students and the lecturers. Core members at NEuroIT and OptomNGO admitted that once the teaching materials were set up in English, translating them to Portuguese was a slow and expensive process and that during the second year of teaching all of the teaching materials had not been translated to Portuguese as yet. The teaching materials (including PowerPoint presentations and course notes) had been translated by the third year of the project and only then were some textbooks in Portuguese made available to the students. There was, however, one occasion during the third year of the project when a member of the teaching staff reported that the teaching materials sent to them were in English. The project member's response was that they would make do with what had been sent by OptomNGO.

Another problem reported by the more experienced lecturers was the fact that they were not allowed flexibility in teaching as they were expected to utilise teaching materials prepared by the team at OptomNGO. They explained that having to teach from standardised teaching aids caused them some frustration as the extent to which they could draw on their own teaching material and practical experience was limited. This may have affected the quality of the teaching. Another factor impacting on the quality of the teaching reported by the more experienced lecturers is the fact that they were expected to teach courses that were not their area of expertise. They complained about teaching theoretical courses that were more the forte of professionals in other departments at UniUS. One of the lecturers reported that OptomNGO said,

..."I want all my lecturers to be optometrists." You don't need to be an optometrist to be pharmacist, er, to be teaching pharmacology. The

opposite...probably he's gonna teach much better than us because he's a pharmacologist, he knows everything about being a pharmacist...

According to these lecturers, the problem was that OptomNGO had stipulated that only qualified optometrists should teach the students from the second year onwards. In their opinion, the quality of the teaching that the students received in some of the theory-based courses, suffered. Lecturers in the other departments at the university were thought to be more qualified to teach those subjects.

What the above discussion shows is that the global optometry curriculum concept was impressive, in theory. However, in practice, implementing standardised materials, especially producing the materials in Portuguese, was complicated. The actors at OptomNGO and NEuroIT argued that using standardised materials reduced the amount of time required to prepare for teaching. However, the experienced lecturers felt that it reduced their quality of teaching. The inflexibility on the part of OptomNGO, because of their focus on developing and piloting their 'global optometry' curriculum, caused problems for the optometry 'professional project' on the ground in Tizangara. This is shown by the challenges presented by the copyright restrictions OptomNGO applied to the teaching materials and the use of teaching materials that had not been translated to Portuguese. The criteria for recruiting lecturers and the language of the textbooks provided, presented further challenges.

The analysis showed how the Training Co-ordinator and lecturers tried to find ways to implement the curriculum with the use of the teaching materials, working within the stipulations of OptomNGO, at UniUS in way that was beneficial to the students. For example, they developed additional course notes to give to the students and initiated discussions on course topics in order to compensate for the lack of textbooks and teaching materials in Portuguese. This shows how the institutions that were embedded in the curriculum by OptomNGO (the producers of the curriculum) posed challenges to the context of UniUS. As Nelson and Sampat (2001: 42) point out, 'technologies' introduced into fields embody 'recipes' or 'routines' from other fields. Similarly, institutions and other characteristics of UniUS posed challenges to the implementation of OptomNGO's global curriculum, requiring the actors implementing the curriculum at UniUS to either adapt to the curriculum or adapt the curriculum. The discussion above shows that they did both. This situation is an example of the '*double osmotic problem*' of implementing international curricula, identified by Cowen

(2007) (see Chapter 4). The success of the training programme thus hinged on the flexibility and initiative taken by the teaching staff and students to overcome the challenges. This points to the way in which actors in the field utilised their human agency in making the system work in the local context and serve their own 'development projects' (see Long, 2001; Mosse, 2005). However, it also revealed the unequal power relations in the DNO with OptomNGO and NEuroIT controlling curriculum development and the supply of study materials, to a large extent. This is discussed in detail in Chapter 8.

Furthermore, as Cowen (2007: 19) indicates, an important question to ask in situations where a pedagogical model or curriculum is transferred from one country context to another is: who defines what is 'good knowledge' and how was it established? (see Chapter 4). In this instance, the OptomNGO, in developing the curricula, defined a 'good' optometry curriculum as one that provides students with the opportunity to learn relevant practical skills important for practising optometry in sub-Saharan Africa and that is internationally recognised at the same time. This is important in the context of the 'network society' where the mobility of students and professionals across borders is an increasingly common phenomenon (Castells, 1999). UniUS, as indicated in the previous chapter (Chapter 4), defined a 'good' curriculum in the same way except that they emphasised the direct applicability of the curriculum more. Key actors at high-level management at UniUS thus argued that they preferred that the students be taught and be provided with study materials in Portuguese, the official language in Mozambique, even if it meant that the materials were not cutting-edge and completely up-to-date.

5.3.2 The professional teaching staff

As indicated in Chapter 2, Mozambique is in dire need of adequately skilled human resources for health care. And the fact that optometry did not exist in the country prior to implementing the MozOptom DNO made it virtually impossible to source optometry expertise locally. As with most of the degree programmes at the university, the university had to import expertise for teaching. However, unlike the other programmes where expatriates supported local lecturers for teaching and co-ordinating the courses and vice versa, the optometry programme was run completely by expatriates (except for the foundation year).

Responsibility for recruiting teaching staff was initially in the hands of the core members at NEuroIT, but was later taken over by OptomNGO because they already had a system in place

for recruiting teaching staff for their training programmes in other African countries. OptmNGO, in consultation with the Network Co-ordinator based at NEuroIT, conducted the first stage of selecting suitable candidates and consulted UniUS for their final approval. In order to attract and retain teaching staff, UniUS and OptomNGO jointly subsidised the staff's salary packages, which included a competitive stipend, accommodation and transport between the university and the city. The teaching staff were thus formally affiliated with both institutions.

The situation of joint affiliation caused some complications as it meant that staff were required to respond to duties as teaching staff of the university and as staff part of the MozOptom DNO. The Training Co-ordinator, in particular, was overloaded with work, often having to complete administrative tasks for the university and the DNO after hours and on weekends. Completing DNO-related activities was especially complicated as they relied on access to e-mail for communicating with core members based at the other organisations, and access to the internet was unreliable until they were provided with mobile internet by the DNO (see Chapter 9).

While conducting the fieldwork, it became apparent to me that the optometry staff were the most privileged of the expatriate staff at UniUS because the optometry department was partly run by the MozOptom DNO and thus benefitted from inputs from the other organisations. For example, when the university cut down on the shuttle service between the university campuses and the city, the teaching staff reported that OptomNGO arranged for them to use the private taxi services instead, while other staff had to rely on the limited shuttle services or find their own transport. Also, the optometry staff received their salary stipend regularly even when other staff complained about the late payment of salaries by the university. There was no indication that this had a negative impact on the relations between the optometry staff and the other lecturers. Some of the other lecturers and students sometimes travelled with the optometry staff between the city and the university by taxi (paid for by the DNO).

OptomNGO and NEuroIT stipulated that all teaching staff possess at least a bachelor's degree in optometry, have some teaching experience and be able to speak Portuguese. In practice, all of the teaching staff recruited held at least a Master's degree and most spoke Spanish rather than Portuguese as most were from Spain or Columbia. The only Portuguese-speaking staff recruited were temporary lecturers who spent a maximum of six weeks in Tizangara to

provide support when necessary (e.g. during the period between a lecturer leaving, and another lecturer being recruited). The members at all of the core organisations part of the MozOptom DNO reported that OptomNGO found it difficult to recruit Portuguese-speaking staff for the project. A core member at OptomNGO provided a reason for this:

DNO Core Management 4: We haven't really succeeded to get a native Portuguese or even just someone who speaks Portuguese that matter...most optometrists are in private practise, they'll be making more money than we are offering in salaries because...we don't have the money to pay really expatriate kind of salary...Plus, the disruption in their life. We'll be offering a one year, two years.

The management at UniUS did not, however, recognise the problem as legitimate as they reported not understanding why the DNO members at NEuroIT and OptomNGO did not manage to recruit staff from Brazil or Portugal, especially since the lead institution is based in Europe. The other requirement was that lecturers had to also be proficient in English in order to be able to communicate with the MozOptom DNO members at OptomNGO and NEuroIT (see Chapter 8 for a discussion on the language gap).

The strategy that OptomNGO utilised in recruiting staff was to advertise the posts on the internet and in the print media. They also relied on personal connections to other optometry and educational organisations. A core member of the team responsible for recruiting staff reported the procedure followed:

I: Where do you advertise?

DNO Core Management 4: Oh, mainly, we put on our website then we [send] it to all the optometrists that we know to [send] it to their friends. And then, um, there are some specific websites that our HR have identified that optometrists visit. So, and we do get quite a good response.

All of the teaching staff reported receiving information about the posts through their contacts that were either involved in the DNO at some level or knew someone involved in the MozOptom DNO. For example, two of the lecturers indicated that they were informed about the posts by a colleague who taught one of the key employees at OptomNGO at university. Another lecturer stated that she received the advertisement via a major aid agency in eye care

with whom she was registered as a volunteer. They received further information via the internet, including information on the organisations' websites, Facebook, and e-mail communication with staff at OptomNGO. The fact that key members at OptomNGO were well-connected in optometry circles in Africa and internationally, facilitated the process of attracting suitable candidates. Since optometry did not exist in Mozambique at the time, the international links were essential.

Recruiting staff from overseas to spend at least one year working in Tizangara was not simple as the core members of the DNO learned during the second year of the project when two lecturers left unexpectedly. When this happened, the department included one individual who had to teach and co-ordinate activities in the department. A reason for this situation, provided by core members of the project, was that the individuals did not easily adapt to the context. A key member of the teaching staff suggested a solution to prevent such an occurrence when asked whether there were any changes to MozOptom DNO that she would suggest:

Optometry Lecturer 6: ...I will say that from the beginning they have to study...how is the situation in the country...education system, that they study the legal thing of the education system, that they study, the cultural thing, the way that they are living, where they are living, how is the accommodation, how is it gonna be for the lecturers...I think it's really, really important before start of project because it's gonna be a guide for them...

In this scenario the teaching staff had to undergo a process of socialisation in adapting to the social, cultural and physical context. This process was important for the teaching staff to understand the realities of the students in order to produce professionals with the skills for providing the optometry services needed in the context. The teaching staff had to understand how to effectively implement the curriculum that was geared towards producing professional optometrists for the context. This is discussed in the next section which focuses on the students enrolled in the optometry programme.

5.3.3 The students

The task of selecting students for the optometry programme was assigned to UniUS. DNO members at the level of management at UniUS reported three major challenges for recruiting students in the health sciences: 1) the lack of importance placed on tertiary education (and

education in general), especially in rural communities, 2) traditional values that tended to discourage females from attending school and pursuing education at tertiary level, and 3) the problem of few students taking up science at secondary school (see Chapter 4). They thus devised creative strategies for recruiting students. For example, a group of representatives from the university visited secondary schools in the Northern region in order to inform students and parents of the programmes offered at the university and promote enrolment in tertiary education. UniUS also offered compulsory foundation courses during the first academic year of the degree programme in order to address the poor quality of schooling in science subjects as well as English. English was compulsory in the foundation year as students obtain only a basic level of English during their schooling even though they are taught the language until secondary school level (Interviews, UniUS Management 2, English Teacher 1). Proficiency in English was also reported to be important for students to benefit from staff and student exchange programmes, in future (Interview, UniUS Management 2). The challenges of recruiting students and how the university addressed them are discussed in detail in the next chapter.

There were some challenges that UniUS experienced specifically in relation to the optometry programme. One challenge was the fact that both physics and biology were requirements for the degree programme. Optometry is the only course with this combination of required subjects in Mozambique, and UniUS is the only tertiary institution that offers training in optometry. Before recruiting students, the university thus had to negotiate with the relevant government body to include the combination in the entrance examination in time for the next intake of students. A DNO member at the level of management at UniUS communicated this challenge:

UniUS Management 4: To enter university or public university in Mozambique you need to go and to do [an] admission exam. But, you do an admission exam normally for two main subjects. For instance, for medicine you do chemistry and biology...For optometry it's completely different...we had for the first time in the history of, um, the exam, the admission exam in Mozambique a programme with two unrelated subjects...So, we had to ask the, um, the commission who manage the exams to respect this specification.

Since they did not make it into the other degree programmes at the university and there was a shortage of students for the optometry course, the students were placed in the optometry programme. One member of the teaching staff described the procedure for selecting students for the optometry programme:

Optometry Lecturer 2: So, basically, when they come to university, they did like an exam and dependent like on their qualification, if they are very good they go to medicine, then they go to dental health, dental health, then to pharmacy, then to nutrition, and the very bad ones, they come to optometry. So, it's not that they choose to do optometry. They choose to go to university, and they choose to do, er, anything related with health.

This issue was raised by five key DNO members. Most of the students who participated in the focus group discussions also reported that they either did not choose to do optometry at all or that optometry was not their first choice.

This situation affected the students' level of commitment to the profession and developing an identity as an optometrist. Commitment to the 'professional project' was especially low among the first group of students recruited for the programme as much of the resources required for teaching in the programme was lacking at that time (as reported earlier). The first group of students reported that they applied for other courses and that they did not know what optometry was until the second year of studies. Since optometry had not been officially recognised as a profession and jobs were not created in the public sector even during their second last year of studies, some of these students reported that they planned to go into other career fields (e.g. Information Technology) rather than becoming optometry practitioners or lecturers. Most of the students indicated that they hoped to get a job in optometry but would be open to any job opportunity so that they can earn a salary. As one third-year student stated (P3): 'First of all, I'd like to work so that I should have some money for my family'.

An additional complication presented by the optometry course is the fact that optometry did not exist in Mozambique before the programme was implemented at the university. The university thus had to take steps to inform students at secondary school, and the local communities in general, of the profession. For example, UniUS, with funds from the MozOptom DNO, hired a film crew to produce a short film that was broadcasted on television

in order to inform communities of optometry and invite applicants to the programme at UniUS. It was suggested by the Rector as way of reaching a wider audience in Mozambique. This was one of the first steps taken to develop the profession in Mozambique. A key project member at stated:

DNO Core Management 1: ...we funded...a Mozambican cameraman and filmmaker to go to (OptomNGO) in (the city where OptomNGO is based) and to go to one of their clinics, um, and an outreach centre to develop a documentary about optometry. And when they came back, we aired two one minute showings on the national TV, um, channel about optometry...and maybe we develop a leaflet as well.

Most of the key members of the MozOptom DNO based at NEuroIT and OptomNGO reported to have been impressed with the commitment and efforts that the management of the university put into disseminating information about optometry in the local community and selecting suitable candidates for the optometry degree programme. One key DNO member at OptomNGO stated:

DNO Executive Management 1: I must say, they [the African university] [chewed] a hell of a lot because recruiting students, getting them from specific provinces, which don't happen in Africa, generally they just advertise any tom dick and his cat comes in...all that research data is important.

5.3.4 Developing foundations of the professional community – shared institutions and identity

Professionalisation of optometry at the university was slow in the beginning, but the situation improved after the second group of students were recruited when the physical training facilities and human resources had been put in place. From the second year onwards, many students reported that they had elected to study optometry as either a first or second choice and they had obtained information on the course from the internet and/or other students. The students reported awareness of the role of optometry in Mozambique in preventing blindness, and the link between poverty and eye care. Interestingly, the first two groups of students were more aware of the development project of the MozOptom DNO than the third

group. The students became more distanced from the project and their identities became more tied to the university than to the project.

By design, the DNO is a mission-driven, temporary organisational structure (see Holohan, 2005). Hence, the focus of the DNO is on achieving the common development goals rather than on establishing roots in the local context. The finding that subsequent cohorts of students in the optometry department identified less with the DNO (and more with UniUS) than students in earlier years thus indicates the success of the MozOptom DNO in developing indigenous capacity rooted in the local context.

The optometry teaching staff, who entered the field in the second year of the project, were integral for developing a shared professional identity, shared institutions for optometry and a sense of belonging in the optometry professional community in Mozambique. Since fields are permutations of the other fields or social networks in which the actors are embedded (Padgett and Powell, 2012), the teaching staff introduced identities and institutions from outside into the context. The social skill of the teaching staff for navigating between their identities and drawing on empathy for presenting a professional identity and cultural frames with which the students could identify, was crucial. For example, a key member of the teaching team described how she draws on her experience of being one of the first optometrists in her home country in Latin America to understand the experiences of the students who are going to be the first optometrists in Mozambique. She also stated that she demanded a lot from the students and motivated them to work hard to ensure that the first graduates are of good quality as they would present the 'standard' for the next group of optometrists produced (Interview, Optometry Lecturer 6).

Another issue reported by the lecturers is that they had to teach the students basic institutions, 'rules' for how to behave in a formal organisational setting like the university, in addition to the professional institutions (for becoming optometrists). For example, the lecturers have a rule that they lock the door of the class 10 minutes after the class started because, in the beginning, many of the students turned up very late to class. The Training Coordinator also advised students to wear more formal clothing (e.g. not wearing informal slip-in shoes) on the days that they did practical training in the clinic, even though they did not always treat 'real clients', so that they internalised the norm of dressing 'professionally' when dealing with clients. The students were also required to wear their white coats, with the

university's logo on the pocket, when they attended classes and when they visited families in the local communities as part of the 'One Student One Family' programme. They were not allowed to eat or chew gum when dealing with clients. One key member of the teaching staff explained:

Optometry Lecturer 6: It's not just the academic ways, everything. It's even the way that they talk, the way that, the presentation that they go to a class...for example, one student was with, in the clinic and was with shoes but like slip-in shoes and I was joking with her. I say to [her], 'We are in the clinic, imagine that the Rector comes and sees you with your slip-in shoes doing a clinic'...So, everyone was laughing. 'Now, what you thinking of and why are you coming like that'.

The DNO member, quoted above, pointed out that the students started practising the values she taught them once they had developed more trusting relationships with her and they had more confidence in her as a teacher. This indicates the way in which institutions are passed on through interaction in fields and the importance of trust in the assimilation of those institutions, which is highlighted in the social network analysis (especially the related social capital literature) and broader institutionalist literatures (see Fligstein and McAdam, 2012; Holohan, 2005; Padgett and Powell, 2012).

Utilising empathy was a very important social skill for the teaching staff in order to understand their students and develop more effective teaching styles. For example, the most senior lecturer described how she visited public schools in the local communities in order to better understand the educational foundation of the students as she found that they were very weak in certain subjects and did not seem to be aware of some fundamental norms for behaviour in an educational setting. After gaining greater insight into the educational backgrounds of the students, she adapted her teaching style accordingly. For example, she got the students to do skits on the theory when she found that they had difficulty understanding the lesson. She incorporated poems and music into the lessons as these were a major part of local culture, as indicated in this quote:

Optometry Lecturer 6: ...sometimes I do examples with theatre. I do the theatre in the same room. Or they write songs about the things that we are studying...So, I try to see the culture, how are they, how they communicate, and, er, I try to adapt some of that things...

She also tried to use real examples to which the students could relate and asked them to try to imagine the experiences of others and how others would perceive them. In this way, she also taught them the social skill of using empathy as professionals:

Optometry Lecturer 6: For example, I say to them, imagine that you are going to the doctor and your doctor are doing like that (makes chewing action), what do you think of the doctor? So, they realise, 'Oh, no, that is disgusting'...So, I always try to put them in examples of life...the reality that they are living here and to the reality that maybe they are going to live in the future.

The reputation of the course also increasingly began to spread by word-of-mouth as more students from the local communities enrolled in the programme and invited friends and family members to participate in their training sessions. Establishing the reputation and respectability of the profession is essential for establishing the legitimacy of the profession (Larson, 1977).

5.3.5 Establishing the legitimacy of the profession

The only core organisations involved in the MozOptom DNO that have expertise in optometry are the actors at OptomNGO and NEuroIT and none of them had worked in Mozambique previously. They thus had not established social ties in eye care in the country. Since optometry did not exist in Mozambique prior to the implementation of the project, there was no optometry professional community, but there was an ophthalmology professional community. However, a major challenge that the MozOptom DNO faced and continues to face is the resistance by the dominant group (i.e. the incumbents) in the ophthalmology community to formally recognise the profession and thus create space for optometrists in the public sector (see Fligstein and McAdam, 2012).

By the end of the present research study, the key members of the MozOptom DNO were still in discussion with the Ministry of Health in order to advocate for the formal recognition of the profession in the public system. This was important in order to get the government to create posts for optometrists in the public sector so that the optometry graduates could provide support to the eye care system in both private practise and the public sector. The resistance they experienced from the major players in eye care, all being ophthalmologists, hindered the MozOptom DNO's advocacy efforts. A problem that five of the core DNO members affiliated

with NEuroIT and OptomNGO identified was that the field of eye care was controlled by the National Eye-care Co-ordinator, who was an ophthalmologist. They attributed the resistance they encountered to the ophthalmologists protecting their 'turf', which has been the case in some states in the United States where optometrists are legally allowed to administer drugs and perform certain surgeries (Lemoine, 1978). Since there was a lack of human resources in eye-care, in general, the project members indicated that they could not understand why the state was not more open to including optometrists in the system. They thus attributed the problem to an issue of ego, power and authority. A key member at OptomNGO reported:

DNO Executive Management 1: ...I think there's some people in Mozambique not understanding the big picture, you know, because really there's no real economic competition. So, I can't understand why this tension is emerging, but sometimes it's around individual person, personalities and so on.

However, according to a key actor in the field of ophthalmology in Tizangara (a senior ophthalmologist), the main reason that the state was reluctant to create jobs for optometrists in the public sector was that they felt it a luxury to hire eye-care professionals who did not have the broad spectrum of skills necessary for treating refractive error as well as eye diseases. Although the state has highlighted the importance of improving the eye-care system in Mozambique along the lines of the Vision2020 plan of the International Association for the Prevention of Blindness (the IAPB), eye care is not a priority of the state and thus there was not much funding available for improving the system. Currently, the state can only afford to have one ophthalmologist and four ophthalmic technicians working in each province serving hundreds of thousands of people. The important role that international NGOs play in improving the eye care system in the country is discussed in Chapter 1.

While the optometry graduates would be allowed to practise in the private sector in Mozambique, the state did not agree to create jobs for optometrists in the public sector. Furthermore, if they wanted to practise in the public sector, they had to gain additional ophthalmology skills in order to do so. Interestingly, Cuban optometry technicians working in the public sector underwent additional training when they first arrived in Mozambique and are now referred to as ophthalmic technicians or refractionists. A key actor in the field of eye care in the Northern region of Mozambique stated strongly:

Senior Ophthalmologist at Tizangara Hospital 1: So, what must be clear is that nobody is against optometry. The problem is, in a country like ours, as I have just said that we have 19 districts with no ophthalmology technician. For me, it is important to have an optometrist and also have somebody who can solve clinical problems. So, the challenge we have is how to emerge in a way that ophthalmology can also be exercised by optometrists so that the optometrists can also make diagnosis on ophthalmology.

This solution was not identified as a possibility by the members of the MozOptom DNO. Most of the MozOptom DNO members at all three core organisations – NeuroIT, OptomNGO and UniUS – reported that the significant role that optometry could play in the eye care system was recognised by many of the ophthalmologists in the public sector. Hence, differences in opinion between the incumbents (influential ophthalmologists) and challengers (actors involved in the MozOptom DNO) with regard to the need for optometry firstly, and secondly, the usefulness of optometry in its current form (based on the curriculum designed by OptomNGO) existed. Based on this finding, it is evident that important questions to ask are: Whose problems are identified? Whose solutions are put forward? Whose needs are being met by the innovation? Are there more appropriate solutions that are not being put forward? (see also Leach and Scoones, 2006; Marjanovic et al, 2012; Stirling, 2009). Considering that both sets of players seem to be working towards reproducing their own social groups, with the incumbents wanting to maintain their status and challengers wanting to improve their status (Fligstein and McAdam, 2012), these are difficult questions to answer. In my opinion, a compromise is possible. It would, however, mean that the ophthalmologists have to transfer some control to the optometrists and create space for optometry in the field, and the optometrists would have to adapt the curriculum (and thus their definition of optometry) for the Mozambican context.

The core members at NEuroIT had initially taken on the role of advocacy for the recognition of the profession, but found it difficult to get key actors in the field, specifically the National Eye-care Co-ordinator, to engage with them (Interviews, DNO Core Management 1, DNO Core Management 2, DNO Executive Management 3). The perception that the National Eye-care Co-ordinator controlled the field of eye care in Mozambique, such that all decisions had to be approved by her, was held by other NGOs in the field as well (see for example, de Barros and Kalua, 2007: 22). Another difficulty that the DNO members encountered was doing advocacy

in a context where they had limited ability in speaking the local language. Furthermore, the Network Manager, who was responsible for advocating for the profession, was based in a relatively isolated region in the country (Tizangara) while most of the state bodies were based in the capital city.

On being informed of the challenge that the members of the MozOptom DNO faced, the core members at DevAid suggested that they make use of DevAid's resources in Mozambique. The core members based at NEuroIT then began to liaise with DevAid's representative for health in Mozambique in order to gain a better understanding of the context and seek advice. The DevAid representative advised them to pass the task of advocacy onto the DNO members at UniUS since they, as locals, already had established relationships with the relevant state bodies to facilitate the process of advocacy (Interview, DevAid 2).

Another strategy that the actors at NEuroIT and OptomNGO employed was to link into local eye care networks. In order for the members of the MozOptom DNO, especially the optometrists who were all based outside of the country, to establish the legitimacy of the profession and raise the profile of the profession, they sought to form ties with actors who were influential in the field. Since they had difficulty liaising directly with the National Eye-care Co-ordinator, they put forward their agenda through their ties with NGOs well-established in the field of eye care in the country. The NGOs formed a national eye-care coalition (MECC) which supported the state in providing eye care services. A core member of the MozOptom DNO described the strategy they utilised for gaining influence in the field:

DNO Executive Management 3: ...we're now engaged with the Mozambique Eyecare Coalition...that's the coalition basically involving OptomNGOs, academic partners plus the Ministry for Health...Um, so, again, we've ensured that optometry is high on the agenda there. Plus our additional NGO partners on the MECC would be very accepting of refractive error as a problem if you like and of our expertise in it, with OptomNGO and NEuroIT.

The Network Manager is the MozOptom DNO's main connection to the coalition and the reputation of OptomNGO and NEuroIT is also crucial in this regard. Other DNO members have now been encouraged to connect with the coalition. This is an example of how the MozOptom DNO has used the strategy of borrowing the social capital of other local social networks in

order to reach influential individuals in eye care in the country for achieving their goals and establishing their reputation (see Burt, 2005). According to a key member at OptomNGO, OptomNGO generally utilises this strategy of borrowing social capital for gaining access into countries where they had no ties:

DNO Core Management 4: ...each country has a national blindness prevention body...It's made up of all eye care NGOs in the country. So, like they form, um, not really a coalition but they meet regularly to appraise on the activities in the country. They lead the [advocacy] in most of these countries because the governments don't have the resources to [lead] it, so OptomNGOs push that a lot. And so, we have aid to get involved in each of those, er, national blindness bodies in the countries. And that is how we get into these networks.

One way in which the MozOptom DNO has managed to raise their reputation and influence in the field is through an indication of their commitment to serving national priorities. In this way, they also used impression management and reciprocity in establishing relationships with other local actors. As Coleman (1988) shows, trust can increase with reciprocity and repeated interaction through building a positive reputation for being trustworthy; and with reciprocity, individuals (and organisations) can collect credit slips that they can draw on at any time (provided the trust was not misplaced). An example of the MozOptom DNO creating credit slips is their contribution to the situational analysis of eye-care services in Mozambique, which was conducted by the MECC. Since the state had limited resources for conducting such research, the situational analysis was conducted by international NGOs in consultation with the National Eye-care Co-ordinator. Through their links with the MECC, the members of the MozOptom DNO also learned the norms and behaviours valued (institutions) in the field of eye care, which was essential for being accepted in the field and thus for getting the optometry profession accepted. Berger and Luckmann (1967: 77) referred to this process of 'going out' to identify and learn institutions in an existing field as 'externalisation'. Since teaching staff in the department of optometry was also introduced to the coalition during the third year of the project, the MozOptom DNO started creating social capital for the nascent local professional community of optometry.

Another example is the involvement of the MozOptom DNO in a large aid-funded project aimed at producing ophthalmic technicians through a local technical training organisation.

This project was implemented by a large group of international eye-care NGOs, the Ministry for Health and UniUS. Although the MozOptom DNO members based at NEuroIT and OptomNGO advocated for the inclusion of optometrists and optometry technicians in the eye care system, they provided the personnel for conducting the module on refraction forming part of the technical training of the ophthalmic technicians. In this way they were able to exert some control over the quality of the refraction skills of these technicians, which is the forte of optometry. In this instance they have portrayed themselves as 'team players' in the field of eye care as a way of gaining entry and recognition in the field (an example of the social skill they utilised).

The MozOptom DNO also attempted to establish their legitimacy and the legitimacy of the optometry profession in the field through their research activities. In addition to their contribution to the situational analysis conducted by the MECC, OptomNGO also conducted a large-scale research project (national scale) on eye care in Mozambique, which would inform their activities. The research of the PhD students, whose studies were funded as part of the MozOptom DNO, also raised the profile of the profession and the MozOptom DNO. For example, one of the research projects involved the vision screening of children in public schools. Optometry students at NEuroIT and UniUS were included in the project. One of the students described how proud he felt when one of his family members recognised him when he visited a school in a local community as part of the screening project:

P7: As my colleague said, it was the very first day that we went to schools and that happened in my village. And I could see the children, I could see my niece and they came to me saying, 'Uncle'. I was wearing the white overall.

This scenario highlights the important role that the interaction between optometry professionals part of the MozOptom DNO and the optometry students, with the local communities for developing the 'professional project'. The 'One Student One Family' programme also contributed to the building of ties between the emerging professional community and the local communities. Other useful initiatives for forming links with the local communities and establishing the profession in the local context included the free screenings that the students did as part of their training, and the free optometry services that the teaching staff provided to the staff at the university.

5.4 Importance of technology for supporting 'the professional project'

Technology, especially ICTs, plays a crucial role in facilitating communication and the sharing of knowledge and other resources in network organisations (see Holohan, 2005; Nohria and Eccles, 1992). The level of interconnectedness and interdependence that characterises DNOs would not have been possible without the support of ICTs (see Castells, 1999, 2000a, 2000b; see also Chapter 1).

Since communication and knowledge transfer in the MozOptom DNO took place across organisational and national borders, the actors in the DNO relied on ICTs to facilitate their interactions with actors based at the other core organisations (see the discussion above and Chapter 9). The modes of information sharing reported to be useful by most project members who participated in the survey are the project website (94%), e-mail updates and notifications (93%), the project newsletter (80%), events (75%), social networking tools (73%) and Dropbox (67%) (see Figure 8).

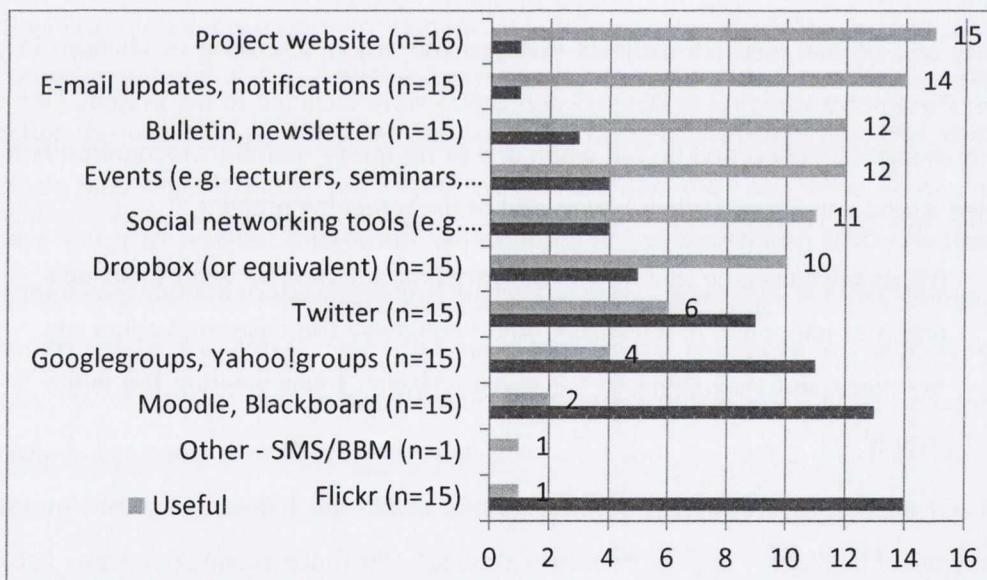


Figure 8 Technological resources supporting knowledge transfer in the MozOptom DNO

Note: The bar chart is based on the survey data, specifically responses to the question: 'Listed below are some of the resources provided by the project. Please rate the usefulness of each resource with regard to project activities'. The number of responses received is indicated in brackets.

Since the use of ICTs in the MozOptom DNO is discussed in detail in Chapter 9, the focus of the discussion in this section is on the use of technology for the transfer of teaching materials and in maintaining links with other social networks in the field of eye-care in Mozambique.

Besides the use of PowerPoint for teaching, the teaching staff also utilised YouTube in teaching, as I observed when attending some of the classes. Although internet connectivity at the university can be unreliable and slow, the times that the lecturer played videos on YouTube, the internet was a bit slow but it did not seem to be a hindrance as she talked (almost) throughout, explaining what was presented in the videos. Some of the videos were also in English, so it was necessary for her to translate for the students.

The teaching materials were prepared by employees at OptomNGO and were sent to the teaching staff at UniUS via the internet, mainly through Dropbox. Generally, this system of transferring files between actors based at OptomNGO and the lecturers at UniUS was not reported to be problematic. The system was only problematic when the internet at UniUS was down, which occurred for a few weeks at a time. The teaching staff would then use the internet at the Network Manager's office which had an ADSL link. Also, the teaching staff were provided with mobile broadband after they complained that the internet at UniUS and their apartment block (provided by UniUS) was often down for more than a month at a time. The problem with the mobile broadband, however, as one of the teaching staff found, was that it came with a data limit of 500MB. This was insufficient for downloading files via Dropbox. They thus disabled Dropbox when using the mobile broadband so that they could have sufficient data to use the internet for checking e-mails, for example.

Access to the internet was also essential for maintaining ties with the MECC. Computer-supported networks can blur the boundaries between organisations and 'are especially suited to maintaining intermediate-strength ties between people who cannot see each other frequently' (Wellman et al, 1996: 231). Communication among the members of the MECC occurred across organisational boundaries. A main aim of the coalition was co-operation for achieving their development objectives. The Network Manager of the MozOptom DNO, who was based in Tizangara, was the main link between the MozOptom DNO and the coalition. All of the members of the coalition met at least once a month, face-to-face, and communicated via their Googlegroups mail account the rest of the time. The Network Manager also communicated with members via Skype. For example, one day when he encountered a

problem in planning a trip for the situational analysis, he entered his 'office' and said that he has to inform the members of the coalition who were based in different parts of Mozambique and in other countries. He then sat at his laptop and started typing. A few minutes later he talked about the responses he received, all via e-mail or Skype. He almost always carried his laptop with him (in his backpack) wherever he went around the city.

Besides the reputation of the actors involved in the MozOptom DNO, the other major mechanism for establishing the legitimacy and respectability of the optometry profession in Mozambique was the available of high-technology equipment for conducting the practical training in the department of optometry. Through interacting with the equipment and being taught how to use it, the students learned the formal knowledge and tacit knowledge for practising the profession. Through conducting the practical tasks, they also started to gain a sense of shared meaning and belonging as they started to perform procedures as 'optometrists-in-training'. For example, one of the students talked about how proud he was to have made his own spectacles in class:

P3: For me it was very emotional to see the cutting machine. It was very emotional. (Takes out the pair of spectacles and everyone laughs) I made with [Dr. Paul]. It's my work. Yes, it's my work. And I'm proud.

The teaching staff also used the equipment to conduct eye-tests for staff at the university, when requested. A senior ophthalmologist at the central hospital in the region indicated that he sometimes used the optometry equipment as they lacked some equipment at the hospital.

Some of the teaching staff, who had jobs in the private sector in countries in Europe and Latin America, reported that they were impressed with the quality of the equipment provided by OptomNGO. Some of the members at high level management at UniUS reported that the optometry programme was gaining a reputation for being a high quality programme equipped with high-technology teaching equipment and skilled teaching staff (Interview, UniUS Management 2, UniUS Management 6). During the third year of the project, UniUS was visited by several Members of Parliament and the First Lady, who were all reportedly impressed with the department.

OptomNGO provided the equipment through its Global Resource Centre, which was one of the few global resource centres globally. The aim of the centre was to source and co-ordinate

the purchasing of equipment at a low cost through buying large quantities and buying direct from the suppliers (Interview, OptomNGO Staff 2). A key employee of OptomNGO explained the aim of the Global Resource Centre at OptomNGO:

OptomNGO Staff 2: So, the profit margins that we put onto that product is not as high as a commercial entity. OK. It essentially, um, is to cover our operating expenditure and to, and there's an excess over and above that, OK, which we will subsidise maybe other parts of the organisation. OK. So, it's very much like a social enterprise concept.

Since OptomNGO is a non-profit entity, it could supply equipment and spectacles to NGOs and government bodies at a lower cost than other suppliers. Using a model of social enterprise, they could also provide supplies to the schools and vision care centres that they were involved in managing, thus cutting costs. The social business would also be used to ensure the sustainability of the organisation by reducing reliance on external funding. According to Naidoo et al (2011: 42),

In the public sector, it is important to find a supplier who understands the philosophy and objectives of your organisation. Social enterprises who conduct operations in the optical industry are usually best positioned to meet such needs as their motive for existing is to make a social impact.

As a key member involved in the social business of OptomNGO explained, forming relationships with suppliers and courier companies was crucial for supporting their development projects. They mainly sourced equipment from China, but also from large companies in the United Kingdom and the United States. China was their biggest supplier for spectacles and other optical equipment as they tended to be the cheapest. They did, however, find that they had to do proper quality checks as some of the equipment was of a poor quality and was thus not worth purchasing for the schools and vision centres. An employee at OptomNGO explained:

OptomNGO Staff 2: It's very specialised. It's, er, you need lots of capital, lots of investment in capital. Equipment is very expensive. There's a few things that we procure from China for the vision centres. OK. Um, you know, we satisfied with the quality, etc. but when you get to certain pieces of equipment, electronic stuff, er, you know, computerised stuff, it's, you

don't wanna go with the Chinese (smiles)...We've actually made the mistake of doing it previously.

With companies in the United Kingdom and the United States, they have sometimes been able to get the companies to support them as part of the companies' corporate social development initiatives:

OptomNGO Staff 2: Um, like for example, with our agreement with [Keeda]...Now, we told them, this is the quantity of sets we'll buy from you. So, given the projections, and based in that they made the decision to give the discounted rate. But also we told them, How would you like to support us in this optometry schools? So, all the sets to the three optometry schools we set, they've donated it.

In order to convince companies to donate equipment or offer discounted rates, they argued that they are creating a potential market for the company in the lower-income countries where they are establishing optometry schools. By producing optometry professional communities in countries where optometry did not exist previously, they are producing future consumers of optical equipment. In this way, certain products may become 'institutionalised'. The OptomNGO employee quoted above added:

OptomNGO Staff 2: If we create, train optometrists, we put the services in place. We are actually creating a market for you to sell your products in the future. So, we're opening the markets...if we get your brand in there and we can get those students, first-time in optometry, using your brand, develop that brand loyalty...

This strategy was not, however, appropriate for the companies in China who were generally not willing to provide major discounts.

Importing equipment into Mozambique was, however, problematic at times. The OptomNGO employee responsible for co-ordinating the receipt of equipment in Mozambique and delivery to UniUS often complained about the equipment being held at customs for months at a time, even after he had completed the necessary paper work. He also complained that the procurement office at UniUS was not helpful. He suspected that the fact that he was not part

of the university and was an expatriate NGO employee may have influenced their lack of enthusiasm in assisting. As a solution, he requested that the optometry Training Co-ordinator liaise with the procurement office to assist in getting the equipment released from customs and also raised the issue with the Rector of UniUS. In importing smaller pieces of equipment, the system was also not efficient and was expensive even though they utilised an internationally renowned courier service. For example, on one occasion the Network Manager was not notified when a package arrived and he found out later, after several visits to the courier's office to track the package, that it had been delivered to UniUS instead. There was also initially a problem with theft at UniUS as it took a while for UniUS to procure lockable storage cabinets for the equipment.

5.5 Conclusion

Interestingly, linking into and/or establishing social networks were at the core of the MozOptom DNO's strategy for developing optometry-related STI capacity with limited funds and local human resources. OptomNGO and UniUS developed partnerships with each other and NEuroIT in order to gain access to aid funding for the bulk of the financial capital for developing the optometry department at UniUS. Secondly, each of the organisations involved in the MozOptom DNO relied on each other for complementary expertise. Thirdly, each of the organisations also linked into other social networks for achieving their own 'development projects' and the common development goals of the MozOptom DNO.

In this chapter, problems with implementing standardised curricula were highlighted. Implementing a standardised curriculum in a context, like Mozambique, where there is a lack of expertise for teaching and a dire need for human capital seems like an effective strategy, in theory. It was, however, problematic in practise. The problems of implementing the pilot standardised curriculum gave the impression that OptomNGO (and by extension, NEuroIT) was more committed to serving their own 'development project' of piloting a training model rather than meeting the needs of the university and the students. This was one reason for the tensions, in the beginning, among the DNO members at the core organisations (see Chapter 7). Making decisions through consensus and organising the network around the needs of the network are important characteristics of DNOs (as discussed in Chapter 2). In this instance, the OptomNGO's control of the development and administration of the optometry curriculum, (to an extent) prevented the occurrence of the organic processes that are advantages of DNOs. This situation raised the question about whose definition of 'good knowledge' informed the

curriculum of the department of optometry at UniUS and whether this was the most appropriate definition (see Cowen, 2007: 19). More research investigating the politics of transferring curricula from one context to the next and the process of implementing standardised curricula is needed (Cowen, 2007).

The scenario also indicates that 'South-South' collaborative arrangements are not inherently devoid of unequal power relations that result in one actor controlling the agenda. In order to address questions about who controlled the agenda and whose needs were being met, an analysis of the pattern and dynamics of relations among the actors involved in the DNO is required. The next three chapters are devoted to this task.

The process of developing the optometry professional community in Tizangara – including the implementation of the global optometry curriculum at UniUS (teaching and learning the tacit and formal knowledge embedded in the curriculum), recruiting staff and students, and negotiating with dominant players in the field of eye care Mozambique –, required social skill. The social skill of the teaching staff in understanding the realities of the students was important for developing shared meanings and norms, and fashioning a common professional identity for the students – which are essential in developing the professional community (see Larson, 1977; Macdonald, 1995). This was highlighted in the discussion in this chapter. The discussion showed how DNO members co-operated (mostly) and worked with what the system gave when needed in order to achieve the collective action required to achieve the common development goals of the DNO. At the same time, they also worked to ensure that their own 'development projects' benefitted. Also highlighted was the role of power, not just between actors in the DNO and dominant actors in eye care, but within the DNO.

Questions that arise from the discussion in this chapter, include: What factors facilitated (and constrained) co-operation among the members of the DNO? What social strategies did they employ for facilitating co-operation? How have actors utilised their social skill for negotiating network institutions and power within the DNO?

Furthermore, useful social ties and adequate mechanisms for the transfer of knowledge and other resources between organisations (and countries) were also essential for developing the optometry 'professional project', which was gradually transforming the field of eye care in

Tizangara. What are the characteristics of the network structure that enabled and supported the transmission of knowledge and other resources within the DNO?

Answers to these questions are useful for understanding how DNOs operate and thus can be utilised as effective mechanisms for accelerating the development of STI capacity in resource-poor contexts like Tizangara, Mozambique. The questions raised in this section are addressed in detail in the remainder of the thesis, starting with an analysis of the network structure of the MozOptom DNO, which is the focus of the next chapter.

Chapter 6 The development network organisation as a transmission system

Recently, the role of development network organisations (DNOs) in STI-capacity development has been highlighted in the literature. Specifically highlighted is the role of DNOs as mechanisms that organisations in resource-poor contexts in Africa utilise for accessing knowledge and other resources not easily accessible in their local contexts, in order to support their STI-capacity development initiatives (see Chataway et al, 2005, 2010; Leach and Scoones, 2006). The value of network organisations and networks, more generally, as systems through which information and other resources useful for innovation are transmitted is well-recognised in the organisational (e.g. Powell and Grodal, 2006; Powell, 1990) and innovation studies literature (see Chesbrough, 2003; Fagerberg, 2006). It is thus surprising that ‘the network organisation’ represents a ‘blackbox’ in the literature. A shortcoming in the empirical organisational literature is the focus on a focal firm or dyads (Powell and Grodal, 2006). Similarly, in the social capital literature, in which the importance of social networks in the field of development is emphasised, there is a tendency to focus on closed groups (Serra, 2011). Hence, linkages with aid agencies are often not included as inter-related or inter-dependent fields (e.g. Lister, 1999). Innovation researchers, especially those employing innovation systems (Fagerberg, 2006) and open innovation systems approaches (Chesbrough, 2003), on the other hand, emphasise that innovation is a networked activity and thus interaction in whole systems is often analysed. However, a major shortcoming of these approaches, especially when utilised in analysing innovation in low-income contexts, is the tendency to neglect the role of power relations and human agency (i.e. what actors actually do) (see for example, Johnson and Lundvall, 2003).

In this chapter and the next three chapters, I ‘open the blackbox’ of the development network organisation (DNO) and show how the social structure and the dynamics of relations among actors (and the relation between the structure and content of ties) influence co-operation in the DNO. In order to achieve this, I propose the use of a network-institutional perspective that conceptualises DNOs as both transmission systems and strategic action fields, integrating network theory and Fligstein and McAdam’s (2012) theory of fields (see Chapter 2 for a discussion on the analytical approach).

The structural positions and power of actors and resource flows within the MozOptom DNO, and between the MozOptom DNO and the key actors in the larger DevAid programme in which it is embedded, are discussed in this chapter. The data discussed in this chapter was obtained via a survey on interaction among members of the MozOptom DNO, and between the MozOptom DNO and actors at the aid agencies (i.e. DevAid and the HEA, NEuro) and key contacts of the other projects funded under the DevAid Programme of Collaboration (PCHE). The survey was conducted in 2012. Data on the existence of ties and frequency of interaction was obtained from responses to the question, 'On average, how often do you communicate with each person below with regard to project-related topics? Communication can be face-to-face meetings, phone calls, internet calls, text messaging or emails'. Although relational data was collected at three stages (i.e. in each of the three years covered in the research), only the analysis of the survey data is discussed here as a comparison of the data revealed that the survey data presents the most systematic account of relations in the DNO. The survey received a response rate of nearly 80 per cent.

Questions addressed in this chapter include: How well-connected is the network (density of interaction)? How frequently do project members interact? Who are the central actors? Who are the bridging actors connecting the DNO to the larger aid programme, and connecting segments of the DNO? Who are on the periphery? What are the patterns of relations in the non-work (friendship) networks? Who tends to turn to whom in making decisions? The quantitative measures utilised to address these questions are discussed next, followed by a discussion on the findings of the structural network analysis.

6.1 Measures employed in the structural network analysis

In the structural network analysis three measures of centrality are employed. These measures are the most commonly utilised measures of centrality in the literature: degree centrality, closeness centrality and betweenness centrality (see Borgatti et al, 1998; Brass and Burkhardt, 1992). Degree and closeness centrality indicate how easily information can reach a network member. Degree centrality refers to the number of ties in which each node (network member) is involved, and average degree indicates the structural cohesion of a network as more ties between network members yield a tighter structure (De Nooy et al, 2011). These measures thus relate to the strength of ties among nodes or bonding social capital. Betweenness centrality identifies nodes acting as intermediaries in communication networks and thus provides information about how crucial a network member is to the transmission of

information through the network (De Nooy et al, 2011). Measures of betweenness centrality are appropriate for investigating bridging and linking social capital (Borgatti et al, 1998; De Nooy et al, 2005).

With the use of measures of degree, closeness and betweenness centrality, the structural network analysis identified central actors within the MozOptom DNO who act as key channels of information within the network and link different groups of individuals who may not otherwise be linked. These central actors thus facilitate co-operation. Bonding, bridging and linking social capital are required for network closure and betweenness – two mechanisms important for the flow of resources within and between networks (Coleman, 1988; Burt, 2005). Network closure is a mechanism through which networks develop high levels of connectivity among actors in the network, which facilitates communication and the sharing of resources within the network. Through network betweenness, network members access and shares resources with actors in other networks. The different types of social capital are discussed in Chapter 2.

Measures of degree, closeness and betweenness centrality also reveal the structural power that actors hold. By identifying the number of ties an actor has, degree centrality measures show the number of alternative sources of information and access to resources in the network the actor has. Brass and Burkhardt (1992) suggest that the more alternatives actors have, the less dependent they are on mediating actors, and thus the more power they possess. They admit that this is based on the assumption that the sources of information are good or beneficial, which is not always the case. They also note that degree centrality is not often utilised in power analysis as it is not a system-wide measure, but suggest that it is useful because it identifies the extent to which actors rely on intermediaries. Closeness centrality is a system-wide measure. It takes into account both direct and indirect ties (giving more weight to direct ties in measuring distance between actors), and, like degree centrality, it identifies the extent to which actors depend on intermediaries. Betweenness centrality is another system-wide measure, but it shows the other side of power in that it identifies actors in control of resources and information flows. Brass and Burkhardt (1992), drawing on Emerson (1962), show how these three measures fit into a dependency framework for analysing structural power.

Barabasi (2002) suggests that in all networks, some central actors tend to have greater influence than others. Actors located in hubs tend to have greater control and influence in the network. This view is in accordance with the institutionalist literature which indicates that larger groups tend to hold greater power in networks, especially when incumbents form alliances with other incumbents (see Fligstein and McAdam, 2012).

The analysis of relations among members of the MozOptom DNO as part of the larger aid programme is presented next, followed by a discussion of the social structure of the MozOptom DNO.

6.2 The MozOptom DNO embedded in the larger DevAid programme

It is important to take into account that networks are not isolated, autonomous units, but are shaped by linkages with other social networks with which network actors interact and the wider institutional environment in which the networks are embedded. It is useful to repeat Fligstein and McAdam's (2012: 18-19) categorisation of external fields here: distant or proximate fields, dependent or interdependent fields, and state or non-state fields.

The external fields that are part of the larger aid programme under which the MozOptom DNO is funded include: actors at the main funding agencies (HEA and DevAid) and the key contacts of the projects still running in 2012 when the survey was administered. The main funding agencies are government organisations and would thus be classified as state fields. They can be described as proximate fields as the actors directly involved in managing the DevAid programme met with actors in the MozOptom DNO regularly and the MozOptom DNO was accountable to them. The state fields thus routinely influenced the field of the MozOptom DNO. The MozOptom DNO was dependent on the funding agencies for financial resources and, in a sense, the legitimacy of the DNO. The funding agencies are, however, also dependent on the MozOptom DNO for their legitimacy. The success of the DNO was related to their success, especially DevAid as the official overseas development agency of NEuro, which makes it accountable to taxpayers. Since the start of the 21st century, aid frameworks have been 'subject to unprecedented critical scrutiny' and thus aid agencies are now in the spotlight more than ever and have to work to show their legitimacy (Mosse, 2005: 1). The relation between the MozOptom DNO and the funders can thus be classified as interdependent. The interdependence between aid agencies and the development projects they fund is often not explored in the empirical capacity development literature (see Marjanovic et al, 2012).

The other external field that was part of the larger DevAid programme (i.e. the PCHE) was the 'project leaders' group, as it was commonly referred to by members of the group (see Chapter 1 for a description of the PCHE). This group was formed during the early stages of the DevAid programme and consisted of the leaders and key contacts of the projects who were invited to participate in the group by members of the other projects. The group was organised informally and independently of the funders in order to share experiences and discuss how best to deal with the challenges they faced within their projects and in dealing with the funding agencies.

The DevAid programme was the first large-scale initiative aimed at getting higher education institutions (HEIs) in NEuro to work together on capacity-building projects. This was the first time that DevAid worked with the HEA and NEuro HEIs at an institutional, as opposed to an individual, level. It was thus a learning experience for each of the organisations, and much confusion existed during the earlier stages. One of the first members of the 'project leaders' group explained the motivation for the group in an interview:

DNO Executive Management 3: the (a European organisation involved in the aid programme)...convenes fairly regular meetings of the leaders of these, um, projects and that has actually been very helpful because we're, the whole programme was breaking new ground with DevAid and they weren't terribly sure what they wanted to get out of it, and I think there were some projects were finding it difficult interfacing with DevAid because DevAid's expectations seemed to be shifting, and, so, it was good for us to be able to share experiences and so on and present a more, um, cohesive voice to, to DevAid.

The organisation of the DevAid programme improved later, after DevAid and the HEA clarified their objectives and expectations. The members of the 'project leaders' group, however, continued to meet to discuss new challenges that they encountered in implementing the projects (e.g. limited access to ICT by project partners in Africa) and possible intersections in their projects that they could take forward (e.g. open-access research depository for all involved in the projects). The interviewee above continued to say: 'Um, but, we've been doing now more is, well, what's the future, is there any one thing that we could agree on to work together on' (Interview, DNO Executive Management 3).

Some of the projects ended in 2011 and as a result, as some project members have reported, the group no longer meets. Considering the role of the 'project leaders' group in the aid programme during the first three years or so of the programme and the fact that the members of the group still kept contact, I included these relations in the analysis. This group did not have a direct influence on the day-to-management of the MozOptom DNO, but decisions made in the 'project leaders' group influenced how the projects dealt with certain issues in the DevAid programme and thus the project, indirectly. The relation between this field and the MozOptom DNO can be described as non-state and distant.

Burt (2005) refers to the analysis of the links between the network being studied and external fields as taking an 'outward' focus as opposed to an 'inward' focus to the analysis. The analysis of the vertical and horizontal relations among members of the larger DevAid aid programme network reveals a large dense network. As noted earlier, in this chapter, interaction refers to communication specifically with regard to programme-related activities, whether the communication is face-to-face, telephonic or computer-mediated. This open approach with regard to the mode of communication was necessary considering that interaction was often transnational and inter-organisational.

Three hundred and twenty four interactions were reported, of which 118 occurred at least quarterly. On average, each actor involved in the network interacted with 14 members. Figures 9 and 10 below present an illustration of the patterns of relations across the three networks. The shade of the lines corresponds to the frequency of interaction.

The results of the structural network analysis show that the Principal Investigator and Network Co-ordinator have the highest levels of degree centrality (42 and 37, normalised degree centrality = 0.91, 0.80 respectively) in the larger DevAid network (see Figure 9). These results are probably due to the fact that these two actors are the representatives of the MozOptom DNO who liaise with actors at the funding agencies and actors involved in the 'project leaders' group. After the Principal Investigator and Network Co-ordinator, the highest number of ties reported are those with the Network Manager (degree centrality = 27, normalised degree centrality = 0.59).

The closeness centrality of the most highly connected actors, the Principal Investigator (0.92), Network Co-ordinator (0.84) and Network Manager (0.67), confirm the central role that these

actors play in the overall DevAid programme network. The actors on the periphery in the sociogram depicted in Figure 9 are those with the lowest number of reported ties. These actors included faculty members at NEuroIT with whom only one network member reported interaction with regard to project-related activities (degree centrality = 1, normalised degree centrality = 0.02; closeness centrality = 0.49), and two members of other projects.

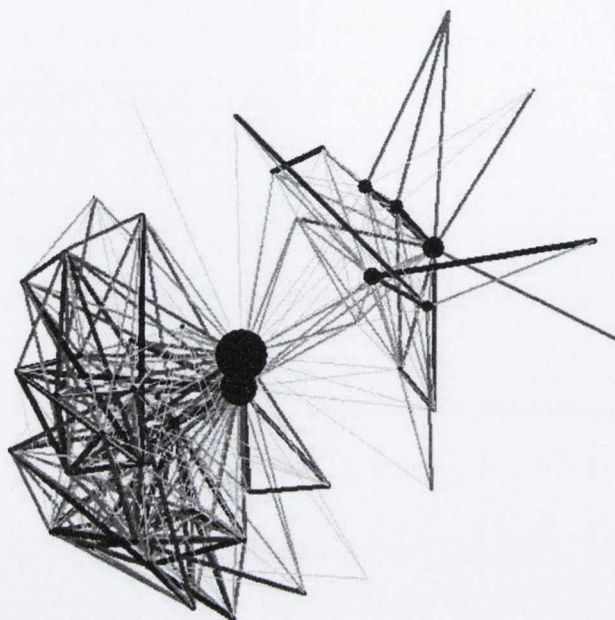


Figure 9 Patterns of relations among actors in the MozOptom DNO and DevAid's Programme of Collaboration (PCHE)

Notes:

- i. The nodes (circles) represent project members with each project member assigned a unique alphanumeric code name based on his/her institutional/organizational affiliation. The two largest circles represent the Principal Investigator and Network Coordinator.
- ii. The size of the vertices (circles representing individual project members) corresponds to the degree of betweenness centrality a project member holds such that the larger circle the higher the degree of betweenness centrality, that is, the greater the role that a project member plays as a channel of communication/information within the network.
- iii. The data was obtained from responses to the question, 'On average, how often do you communicate with each person below with regard to project-related topics? Communication can be face-to-face meetings, phone calls, internet calls, text messaging or emails'. The shade of the lines corresponds to the frequency of

interaction such that the darker the shade the higher the frequency of interaction reported. The scale for the frequency of interaction is: 1-once or twice a year, 2-quarterly, 3-once or twice a month, 4-weekly, and 5-daily.

- iv. The data is based on responses of 21 members of the MozOptom DNO and 6 individuals at DevAid, the HEA and other higher education institutions involved in the larger DevAid Programme of Collaboration (PCHE) that were still in operation in 2012. Interaction with individuals at the HEA occur as need arises, and the frequencies reported are averages.

Betweenness centrality indicators show that the Principal Investigator (0.36) and Network Co-ordinator (0.19) act as key channels of information between the different groups of individuals making up the overall network. The size of the vertices in Figure 9 corresponds to the levels of betweenness centrality network members possess, that is the extent to which they act as bridging actors between different groups of network members.

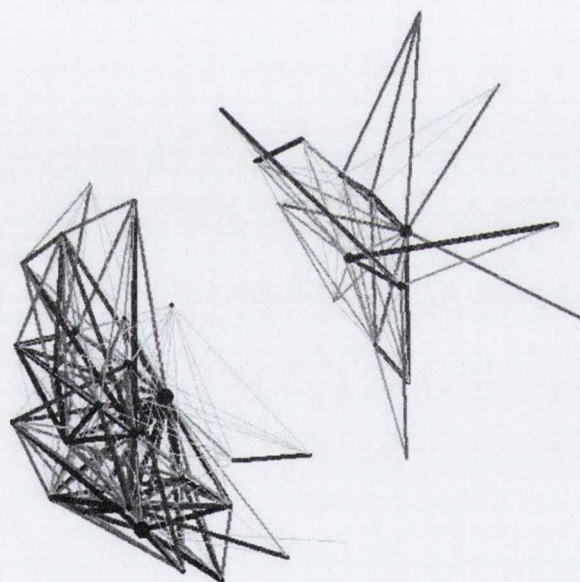


Figure 10 Patterns of relations among actors in the MozOptom DNO and DevAid's Programme of Collaboration (PCHE) excluding the Principal Investigator and the Network Co-ordinator

Notes: See notes of Figure 9.

In order to further examine the significant role that the Principal Investigator and Network Co-ordinator play, these actors were removed from the analysis. Not surprisingly, once they were removed from the analysis, the link between the funding agencies and the other members of the 'project leaders' group based in Europe disappeared, resulting in an additional bi-component or cluster (see Figure 10). This finding shows the key roles that these two actors

play as bridging actors (or cut vertices) between the MozOptom DNO and the networks of the larger DevAid programme in which it is embedded. The two actors (i.e. the Principal Investigator and Network Co-ordinator based in NEuro) and the Network Manager (based in Tizangara, Mozambique) also had links with an advisor at DevAid's office in Mozambique, but this relation was basically to seek advice on challenges with regard to the context and not with regard to decision-making or monitoring and evaluation (M&E).

The connection of the Principal Investigator and Network Co-ordinator to actors at the funding agencies indicates the linking social capital that these actors produced in the network, which benefitted the overall network (see Patulny, 2009). However, it also shows the structural power that these two actors held in controlling communication and resource flows between DNO members and members of the larger aid programme. Although aid institutions are seldom included in analysis of development networks, research has shown that having opportunities for direct communication between all network members and the funding agencies can be beneficial in facilitating the negotiation of shared meanings and for network members and funding agencies to gain an appreciation of each other's expectations (e.g. Marjanovic et al, 2012). Negotiating shared meanings and communicating expectations facilitates co-operation (see Chapter 7).

Furthermore, relying on just two actors to process *all* communication and resource flows between two significant (and sizable) parts of the larger network – the MozOptom DNO and the key actors in the larger DevAid programme based in NEuro – also makes the network structure vulnerable to endogenous (e.g. actor being ineffective in processing and directing information flows or leaving the DNO) and exogenous threats (e.g. change in law) (see Watts, 2003, 2004). Multi-layered, team structures are more resilient (Watts, 2003, 2004). Interestingly, the organic structure of the MozOptom DNO, which was determined by the mission of the DNO and developed through network logic, was a multi-layered structure including sub-networks or teams.

I now take a more inward focus by analysing the relations within the MozOptom DNO – excluding actors at the funding agencies and 'project leaders' group, who influence DNO activities to a certain degree but are external to the day-to-day running of the DNO.

6.3 'Inside' the MozOptom development network organisation (DNO)

6.3.1 Formal (work-related) network

In this section, the analysis of the formal relations among the MozOptom DNO members, that is, interaction specifically with regard to DNO-related activities, is presented. Figure 11 illustrates how well-connected the DNO is. The MozOptom DNO includes 28 vertices (or actors) and 230 interactions, with 158 of these occurring, on average, at least quarterly. On average, DNO members were connected to 16 other members. The actors located on the periphery included actors at NEuroIT who were included in DNO activities as need be and were not involved in the core activities of the DNO. It is thus expected that they would be marginal.

Several actors acted as key channels of information within the DNO (indicated by the relatively large vertices in Figure 11). Table 2 shows that the Principal Investigator, Network Co-ordinator and Network Manager were the most central actors in the DNO, that is, the most well-connected actors (see the degree centrality) with the closest ties (see the closeness centrality). The Network Manager and Network Co-ordinator shared the roles of facilitating co-operation and communication in the DNO, after the Principal Investigator. The Principal Investigator held the highest level of betweenness centrality, indicating the important role he played as a channel of information between actors in the DNO.

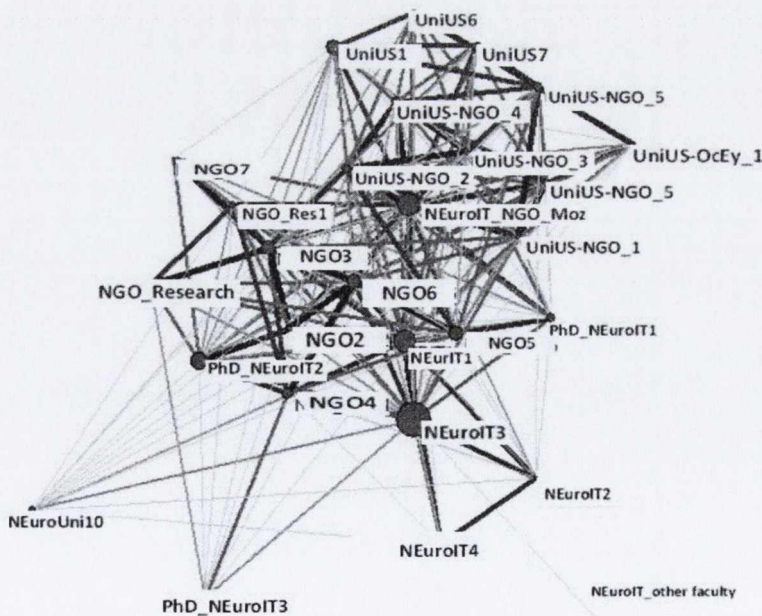


Figure 11 Sociogram of the MozOptom DNO (identifying bridging actors)

Note: See the notes to Figure 9 above.

Project member	Degree centrality	Closeness centrality	Betweenness centrality	Decision-making: Input degree*
Principal Investigator	27 (1.00)	1.00	0.12	11 (0.44)
Network Co-ordinator	26 (0.96)	0.96	0.05	6 (0.24)
Network Manager	26 (0.96)	0.96	0.05	10 (0.40)
Global Director HRD (OptomNGO)	22 (0.82)	0.84	0.02	9 (0.36)
Training Co-ordinator	20 (0.75)	0.79	0.01	7 (0.28)
Director of OptomNGO	19 (0.70)	0.77	0.02	6 (0.24)
Rector of African Univ	20 (0.74)	0.79	0.02	6 (0.24)

Table 2 Results of the measures of centrality and cohesion within the MozOptom DNO

Notes:

- i. *normalised values are in brackets
- ii. input degree = number of DNO members who reported consulting the DNO member before making important decisions related to project activities

Other actors who were well-connected included a PhD student (who was previously a sub-Regional Manager at OptomNGO) (degree centrality = 23, normalised degree centrality = 0.85; closeness centrality = 0.87), the current sub-Regional Manager (Southern Africa) at OptomNGO (22, 0.82; 0.84), and the Global Director Human Resource Development (HRD) at OptomNGO (22, 0.82; 0.84). These findings are expected as the PhD student was conducting an evaluation of the MozOptom project as part of her PhD research and thus she would have been in contact with most of the key actors in the DNO. The sub-Regional Manager at OptomNGO was involved in the core management team of the DNO. He was responsible for managing OptomNGO's involvement in the DNO. He was one of the main actors at OptomNGO to which the optometry lecturers and the Network Manager reported. The optometry lecturers and the Network Manager were all officially affiliated with OptomNGO as employees, although their salaries were funded by the MozOptom DNO budget (i.e. mainly the DevAid funding). The Global Director HRD at OptomNGO was responsible for overseeing the hiring of teaching staff and co-ordinating the curriculum development activities.

In sum, three actors were identified as the most central actors in the formal network of the MozOptom DNO: the Principal Investigator, Network Co-ordinator and Network Manager. This finding is not surprising as these actors were responsible for co-ordinating the core activities

in the DNO and were thus expected to be well-connected in the network. They, however, did not act as cut vertices as the bi-components analysis showed that the DNO remained connected when they were removed from the analysis, except for the connection with other faculty members at NEuroIT who were reported to be involved in the DNO but were generally not included in the day-to-day management of the DNO. These findings indicate that the Principal Investigator, Network Co-ordinator and Network Manager facilitate communication and information sharing within the DNO, but DNO members were able to find alternative ways of communicating with each other besides communicating via them. This implies a high level of bonding social capital within the DNO as a whole.

As central and bridging actors, the three central actors hold power in the DNO related to their position DNO. The structural power that actors hold in the DNO was explored further through an analysis of the decision-making networks within the DNO.

6.3.2 Decision-making networks in the MozOptom DNO

One question in the survey elicited information about who DNO members turned to in making decisions on DNO-related issues. As shown in Table 2 (above) and Figure 12 (below), the DNO members that most turned to prior to making important decisions with regard to DNO-related activities included: the Principal Investigator, Network Co-ordinator, Network Manager, the Global Director HRD at OptomNGO and the Training Co-ordinator. In the analysis above, the first three actors were identified as central actors in the DNO and thus it is expected that they would be identified as key in the decision-making processes. The other two actors led teams or sub-networks on specific DNO activities. The Global Director HRD at OptomNGO was responsible for overseeing the hiring of teaching staff for the optometry training programme. DNO members also referred to him as the curriculum expert in the DNO. He was thus responsible for the development of the global optometry curriculum. The Training Co-ordinator was responsible for co-ordinating teaching activities in the optometry department at UniUS. She was thus also one of the DNO's key contacts at UniUS.

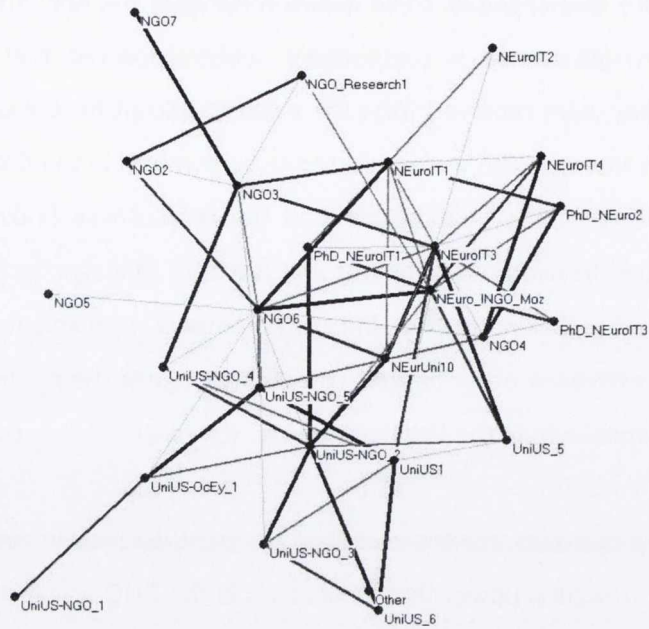


Figure 12 Sociogram of the decision-making network of the MozOptom DNO

Notes:

- i. See notes i-ii of Figure 1.
- ii. The shade of the lines corresponds to the scale: 1 = first, 2 = second, 3 = third and 4 = fourth. The darker the shade, the higher the score on the scale.
- iii. The data is based on responses to the question: 'Please select the individuals you turn to first, second, third and fourth for input prior to making an important decision with regard to project-related activities'. Twenty DNO members responded to the question.

I isolated the results for those who were identified as the first person that DNO members turn to in making a project-related decision. An interesting finding is that the DNO members not only selected DNO members who head the teams to which they belonged, but also DNO members that were in close physical proximity. For example, those who identified the Principal Investigator as the first person they would turn to in making a decision, included the PhD students he supervised and other project members based in Europe.

6.3.3 Informal (friendship) networks in the MozOptom DNO

Much research has shown that both formal and informal interaction, that is, non-work related interaction, facilitates co-operation in inter-organisational networks (e.g. Holohan, 2005; Ibarra, 1992; Saxenian, 1994). Socialising outside of work increases interaction between actors and thus opportunities for actors to gain more (verbal and non-verbal) information about the people with whom they work, informing the mental 'pictures' they form about them. Through interaction, individuals develop norms about each other and draw on these norms in the strategies they use for interaction (Coleman, 1988). Repeated interaction among actors facilitates the formation of more complete mental 'pictures' of other DNO members (Berger and Luckmann, 1967) and thus more informed strategies for interaction (Fligstein and McAdam, 2012). This facilitates reciprocity and the development of trust, which reinforce each other (see Coleman, 1988; Uzzi, 1996).

Figure 13 (below) illustrates the formal (work-related) and friendship (non-work related) interaction among members of the MozOptom DNO. What is evident in the sociogram is the blurring between formal and friendship relations, which is a significant characteristic of network organisational structures as flexibility and horizontal lines of control is emphasised (see Burns and Stalker, 1961). The blurring between formal and friendship ties is particularly evident in contexts where network members are immigrants to the physical context, whether temporary or permanently, and migrants tend to meet regularly in social spaces after work and on weekends (Holohan, 2005; Saxenian, 1994). The "'third culture" identity' (Long, 2001: 230) phenomenon that I observed among DNO members in Tizangara is discussed in detail in the next chapter.

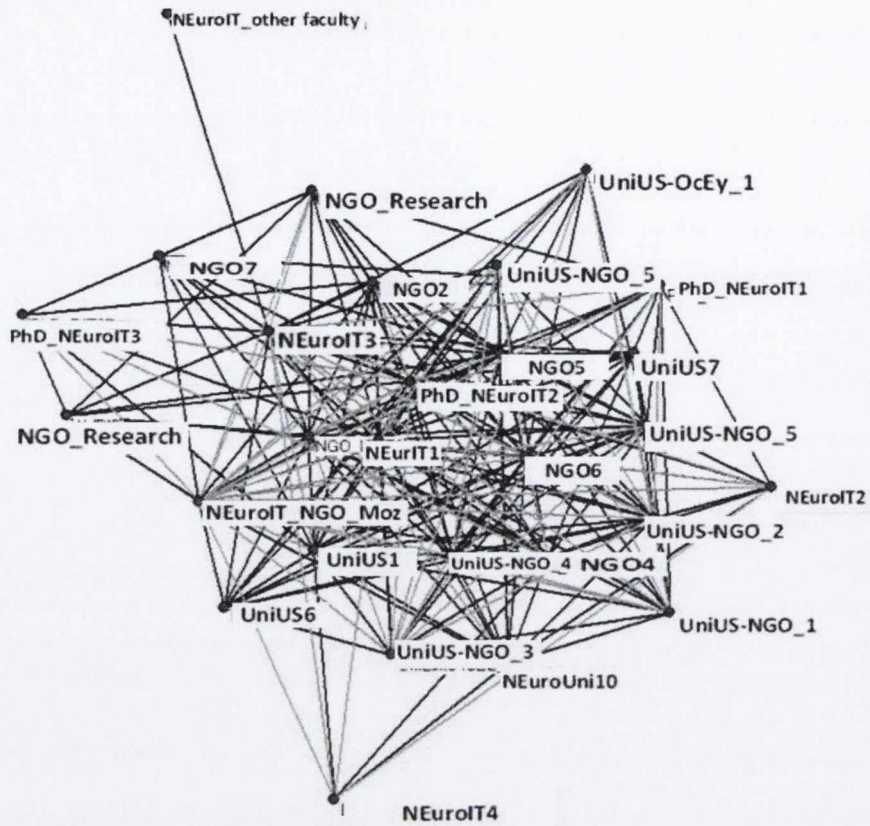


Figure 13 Formal and 'friendship' (non-work related) interaction within the MozOptom DNO

Notes:

- i. See notes to Figure 1.
- ii. Grey (lighter) lines = average informal (non-work related) communication (reported by 14 project members); black (darker) lines = average formal (work-related) communication (reported by 21 DNO members)

The analysis of the formal relations in the MozOptom DNO is presented above. This section focuses only on the friendship relations which were extracted from the Pajek data file. On average, DNO members interacted 'informally' with four other DNO members and a total of 60 'friendship' ties were reported.

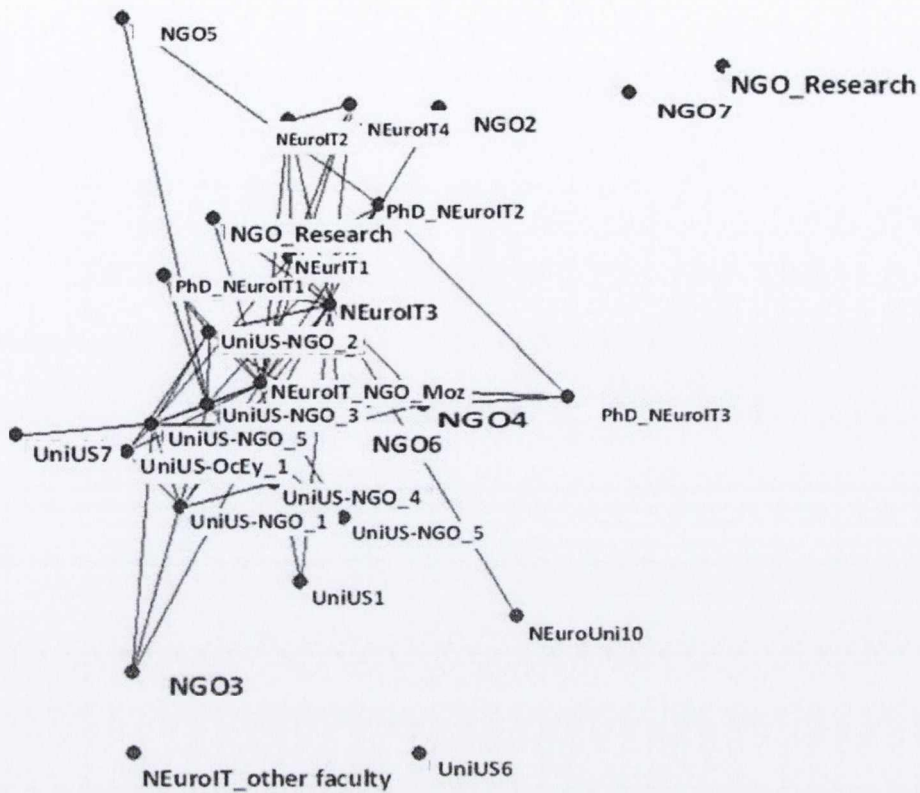


Figure 14 'Friendship' (non-work related) interaction within the MozOptom DNO

Note: The interactions depicted were reported by the 15 DNO members who indicated that they 'socialise' with other DNO members.

The Network Manager stands out as the DNO member with the highest number of 'friendship' relations (degree centrality = 17, normalised degree centrality = 0.63) and the closest social ties (0.68). He also acted as a 'social' link or intermediary between DNO members (betweenness centrality = 0.28). The next central actor in the MozOptom DNO's 'friendship' network was the Principal Investigator (degree centrality = 12, normalised degree centrality = 0.44); closeness centrality = 0.51; and betweenness centrality = 0.13). It should be noted that the question in the survey eliciting the information on 'friendship' networks was answered by fewer project members, 15 out of 28, and thus was less robust than the data on the formal interactions in the DNO.

6.4 Conclusion

A strength of the structural analysis is that it presents a systemic overview of the social structure of the DNO as it is based on reports from 22 out of the 28 members of the MozOptom DNO. The data analysed is thus robust and the sociograms provide visual aids to the analysis and an illustration of structural features. Analysing different sub-networks also

provide different perspectives of the social structure, thus enhancing the structural network analysis. The structural network analysis also points out power dynamics related to structure. The most central actors in the MozOptom DNO were the two core DNO members at the lead institution in Europe and the Network Manager, who was also from Europe and was recruited specifically for the DNO. Drawing on Fligstein and McAdam's (2012) theory of fields, we understand that more powerful actors have more influence in how the DNO is organised, the agenda and DNO activities generally. The actors identified as the most central actors in the network are thus in a position to assert greater control over network activities.

The analysis is, however, limited in presenting an understanding of exactly how central actors exercise power in DNOs, specifically, what strategies they utilise. Furthermore, structural network analysis cannot present an understanding of the dynamics of relations among the project members, the negotiation of institutions and the social mechanisms regulating behaviour in the DNO, and the strategies project members utilise in producing and reproducing the structure. Also, since the structural network analysis is based on cross-section data, it does not provide an understanding of how the network was formed, how network members dealt with challenges, and how it stabilised over time (see Fligstein and McAdam, 2012). These shortcomings of structural network analysis have been identified recently by social network analysis (SNA) researchers calling for an integration of qualitative and quantitative methods for enhancing the explanatory power of SNA (e.g. Crossley and Ibrahim, 2012; Edwards, 2010; Edwards and Crossley, 2009; Knox et al, 2006; Mische, 2003).

In this thesis, I address the limitations of the structural network analysis by complementing it with a qualitative analysis (i.e. thematic coding) of rich qualitative data (i.e. 'thick description' [Geertz, 1973: 6] obtained via ethnographic research and the transcripts of interview data). The qualitative analysis is discussed in the next two chapters. The discussion addresses the questions that arose from the structural network analysis presented in this chapter: How did the DNO emerge and stabilise? What role does social capital play in the DNO? How do the central actors develop the different forms of social capital they possess? More specifically, what social skills or strategies do they employ as facilitators of co-operation and key resource channels? What are the other DNO members' perceptions of the leadership skills of the central actors? What impact does power have in the DNO?

Chapter 7 The development network organisation as a strategic action field

In Chapters 6 to 8 of this thesis, I present a micro-analysis of different aspects of the MozOptom development network organisation (DNO) as a way of 'opening the blackbox' of DNOs. I show the usefulness of a network-institutional approach for conducting this type of analysis. In this way, I attempt to address a gap in understanding about how DNOs operate as mechanisms for accelerating STI-capacity development in resource-poor contexts.

The main reason that actors seek to collaborate in mission-driven inter-organisational networks (DNOs) is to benefit from the opportunities to pool resources and lend on the complementary assets (physical capital and expertise) of others in order to achieve specific goals. Co-operation is thus a major concern in DNOs. In Chapter 2, I identified five characteristics of DNOs that facilitate co-operation, drawing on the literature on networks and network organisations. The five characteristics include : 1) the tendency to organise the network structure around a common mission and identity, that is, using a network logic of including and excluding actors based on their value for the mission of the DNO; 2) a network structure designed for efficient information-sharing and information-processing; 3) institutions guiding behaviour and social mechanisms of control; 4) the centrality of individuals; and 5) the importance of face-to-face communication and ICTs in facilitating communication, especially communication across organisational and national borders (see Borgatti, 2001; Borgatti and Foster, 2003; Holohan, 2005; Nohria and Eccles, 1992; Powell, 1990). Based on the findings discussed in this chapter, I make two additions to the framework: 1) the role of a kind of 'innovation broker' who identifies a novel idea and links actors useful for applying the idea, and 2) the role of skilled strategic actors (see Fligstein and McAdam, 2012). In the analysis of the MozOptom DNO, skilled strategic actors emerged as key for supporting the process of producing and reproducing the DNO, which are processes facilitated and constrained by power. The framework is illustrated in Figure 15 below. It is thus grounded in the analysis of the empirical data on the MozOptom DNO.

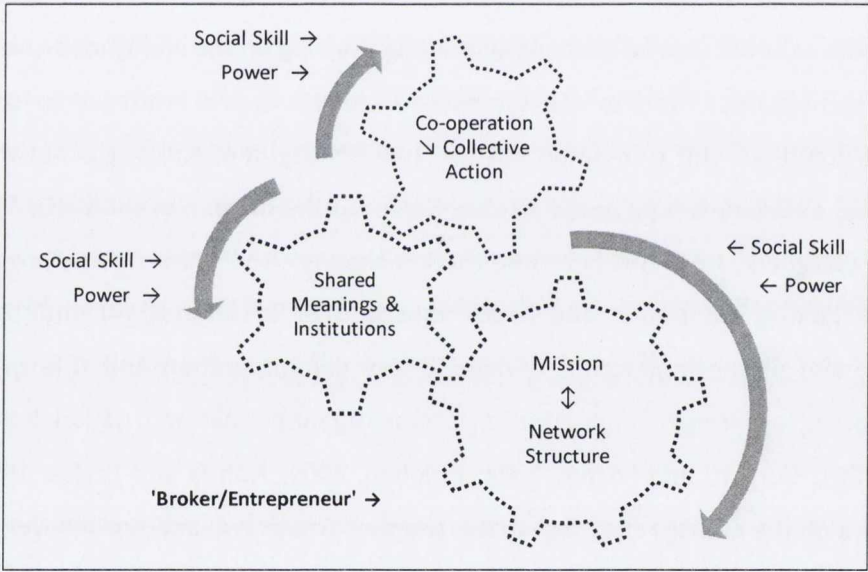
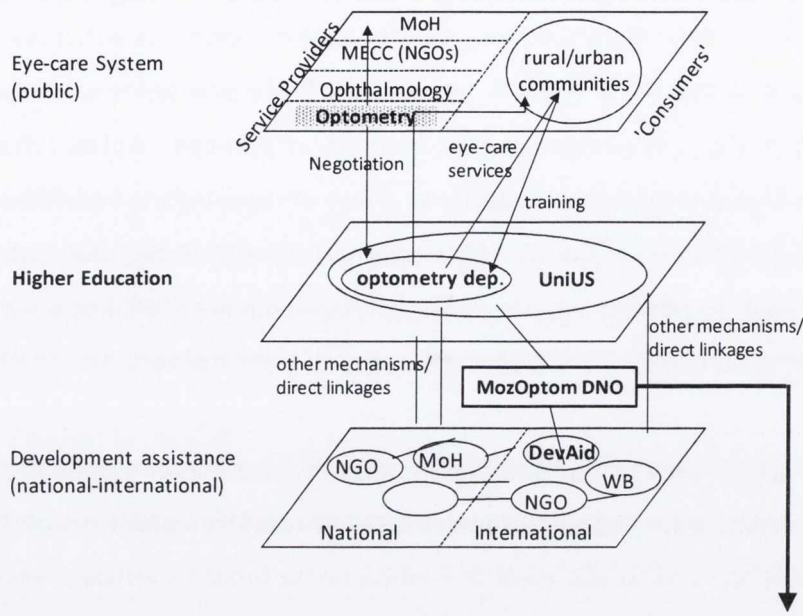


Figure 15 Embeddedness and 'inner workings' of the MozOptom DNO

The discussion in the previous chapter focused on the *social structure* of the DNO. The focus of this chapter is on the *process components* of the network, including the dynamics of relations, negotiation of network institutions and the social strategies employed by skilled strategic actors, which are facilitated and constrained by the social structure (see for example, Wellman, 1983).

While the structural network analysis presented an analysis of the DNO relations that is a snapshot of the social structure of the MozOptom DNO and networks of the larger DevAid programme in which it is embedded, this chapter presents an analysis of the processes of

emergence, stabilisation and transformation of the MozOptom DNO. The effect of power relations emerged as a key issue in both the quantitative and qualitative analysis. Since institution building is embedded in power relations (Fligstein and McAdam, 2012), the discussion of power in this chapter is intertwined in the discussion on the emergence of the DNO and the negotiation (and renegotiation) of network institutions among actors in the DNO.

The analysis focuses on the main threads carrying through the stories reported by the actors involved in the DNO in the interviews and through my observations in the field. The quotes presented here were selected specifically because they were the best articulated accounts. Questions addressed in this chapter include: Why and how was the DNO formed? Which factors impacted on co-operation in the DNO and what role did power play in this? How were the institutions guiding interaction and governing the DNO (i.e. network institutions) negotiated and renegotiated? Why was the development of a 'DNO identity' important, how was it developed and which factors shaped the development of a common identity? How were challenges and problems addressed?

The starting point for the MozOptom DNO, like any other strategic action field, is the formation of the network of actors. This is discussed next.

7.1 The common mission of the MozOptom DNO

Interestingly, the impetus for the MozOptom project came from the African organisations. The project is largely the brainchild of the Director of OptomNGO, which is based in Southern Africa. The training programme was not only the first optometry training programme to be developed in Mozambique, it was also a pilot initiative that was part of a larger development project of OptomNGO. The aim was to pilot and evaluate the implementation of a multi-level training programme for optometry in Southern Africa. The multi-level training model was designed to produce graduates at the technician as well as degree levels in order to serve different needs of the eye care system according to different timeframes. This was an innovation developed by the Director of OptomNGO and the plan was to pilot the training model in different parts of Southern Africa, in Anglophone and Lusophone countries. A strategic actor at OptomNGO described how the project started:

DNO Executive Management 1: ...we got a DevAid grant with (another eye care NGO based in Europe). OK. Um, and (the Director) called (the Director

of OptomNGO) and said, you know, there's some funding available to do programmes and there's a NEuro, NEuroIT's looking for a project with, is available if you wanna partner with them to do anything...NEuroIT...wanted to get it but didn't know what to do, right... And what we did was, (the Director of OptomNGO) then recommended, let's look at a proposal that looks at a multiple entry and exit model, implement it, you know, implementation and evaluation of the model.

The Director of OptomNGO then initiated links with the lead Northern European organisation (i.e. NEuroIT) and linked UniUS with NEuroIT and NEuroUni, thus acting as a type of 'innovation broker' (Hargadon and Sutton, 1997) linking across a structural hole (Burt, 2005). These links were made through personal contacts.

The proposal submitted to DevAid was based on the research proposal that OptomNGO had prepared for piloting the multi-level optometry training programme in one of the Anglophone countries in Africa. It was tweaked to fit DevAid's requirements:

DNO Executive Management 1: And basically the first round was based a lot on (the Director of OptomNGO) taking a Malawi proposal and tweaking it, to be quite frank with you... And the second round, NEuroIT, that's when NEuroIT's time, you know, people, input really helped a lot...We (OptomNGO and NEuroIT) had great intellectual exchange and whatever...They (NEuroIT) had no qualms about the fact that the idea originated in Africa.

This actor continued to describe how the initial common mission was negotiated among the actors at OptomNGO and NEuroIT:

DNO Executive Management 1: And because it's research they thought it would be good for them to, so, I said to them, look, what I think is that there's debate around this approach and optometry training in Africa. What we need to do is to test a pedagogical model and, but, really, we need the programme, we need the money for the programme, you know. But DevAid's not (going to) give you the, but let's use then this opportunity to test a pedagogical model.

The mission of the MozOptom DNO was thus shaped by 1) the multi-level training programme developed by OptomNGO, and 2) the terms of reference of DevAid's call for funding. As indicated in the quote above, actors at NEuroIT were also instrumental in developing the project proposal that communicated the mission of the MozOptom DNO, whereas UniUS was more on the periphery at that stage (discussed later).

The general consensus during the first year or so of the MozOptom DNO was that the main goal of the DNO was to develop optometry capacity in Mozambique, starting with the development of an optometry training programme at UniUS. The actors then pinned their own interests and meanings to this mission, producing commitment to the overall mission. The group of actors did, however, find it difficult to produce the kind of social order that would facilitate co-operation among them.

7.2 Producing social order – common mission, identity and institutions

According to Fligstein and McAdam (2012: 109), new fields emerge 'when at least two groups seek to occupy previously unorganised social space. The absence of shared rules and understandings makes this an inherently unstable situation'. From Padgett and Powell (2012), we learn that fields emerge in the overlapping spaces between social networks. Shared institutions and meanings among the key actors involved are required to produce social order in the 'unorganised social space' (see Berger and Luckmann, 1967; Fligstein and McAdam, 2012; Giddens, 1979; Padgett and Powell, 2012). Two strategies can be utilised to produce social order: 1) the dominant social groups (i.e. the largest groups and/or those possessing the most resources) could impose institutions they internalised from interaction in other social networks, or 2) 'new' institutions could be negotiated amongst the actors in the 'social space' (Fligstein and McAdam, 2012: 109). Fligstein and McAdam (2012) indicate that the second option is more appropriate in fields where collective action is of paramount concern as collective action requires a higher level of loyalty and commitment, which depends on the existence of shared meanings and institutions. In DNOs, a collective identity to which actors can pin their own identities and interests is required (see Borgatti, 2001; Holohan, 2005). In this section, I describe how the actors in the MozOptom DNO developed a collective identity and shared institutions in establishing a strategic action field (i.e. the MozOptom DNO).

7.2.1 Negotiating institutions during the initial stages

All of the core organisations in the DNO were included in the proposal-writing process in the sense that the proposal was shared amongst them and each were invited to participate. However, in practice, active engagement was skewed in that there was more active involvement in the process from OptomNGO and NEuroIT. At that time, discussions took place via telephonic, face-to-face and e-mail communication, mainly between actors at OptomNGO and NEuroIT. This situation provided opportunities for repeated interaction among actors at OptomNGO and NEuroIT, and thus opportunities to develop norms for interaction, which facilitated the development of stronger ties and thus trust (Coleman, 1988; Fligstein and McAdam, 2012; Uzzi, 1996). As Berger and Luckmann (1967) explain, institutions arise through the repetition of certain behaviours to which actors attach meaning. Frequent interaction is thus important for institution-building. Face-to-face interaction, in particular, is essential for institution-building as it makes available the widest range of information about the actors with whom we are interacting, which informs our strategies for interaction with those actors (Berger and Luckmann, 1967; Coleman, 1988; Nohria and Eccles, 1992).

After the MozOptom project proposal was approved, project launch events were held in Mozambique and NEuro. Initial discussion meetings were also held and a Memorandum of Understanding (MoU) that stipulated how work was to be divided and co-ordinated was signed by the key actors at the core organisations.

By the third year of the project, the ties between key DNO members involved in the daily management of the DNO based at OptomNGO and NEuroIT were among the strongest within the network. This is shown by the high frequency of communication (from daily to weekly) reported by these actors in the interviews and the survey (see Chapter 6). Key DNO members within these organisations have indicated that the relationship between them is characterised by *'total trust'* (Interview, DNO Executive Management 1). OptomNGO is considered a co-funder of the DNO and the idea originated from them. Furthermore, OptomNGO is not dependent on the DNO for carrying out its core activities as it is a self-sustaining organisation – through its social entrepreneurship activities and royalties from a patent. An employee involved at the level of management at OptomNGO indicated that they could easily exit from the MozOptom DNO if they felt it no longer worked for them:

DNO Executive Management 1: 'We can do it ourselves, we'll have more control...we're not desperate for it, you know'.

According to Barabasi (2002), those who enter networks first and hubs tend to have greater influence in the functioning of the network, and thus greater power. Also, hubs tend to be more resilient to endogenous and exogenous challenges (Watts, 2004). From an institutionalist perspective as well it is suggested that larger groups in the network have greater control and influence over network activities (see Fligstein and McAdam, 2012). On the basis of stronger ties and shared meanings, the situation of greater participation from actors at OptomNGO and NEuroIT opened up opportunities for actors at these organisations to form alliances and thus wield greater influence on the organisational design and activities of the DNO. The actors at UniUS also recognised the alliance (Interview, UniUS Management 6).

At the stage when the common mission of the DNO was being negotiated, the actors who were more actively involved in the initial process of forming the DNO had greater say in determining the common mission. This was perhaps a missed opportunity for the actors at UniUS to influence the process as they were still more on the periphery at that stage, as reported in the interviews with key actors at NEuroIT and OptomNGO describing the involvement of the actors during the initial stages:

DNO Executive Management 1: We (key actors at NEuroIT and OptomNGO) had teleconferences. (The Director of OptomNGO) even went there (to NEuroIT) and all of that.

DNO Executive Management 3: UniUS haven't been, um, involved constructively there as much as they should be. Um, but I'm not sure that we know really how to fix that. So, other than just basically making sure that they're aware of what we (OptomNGO and NEuroIT) are discussing and want to do.

The last quote indicates that once OptomNGO and NEuroIT formed an alliance, they utilised an alternative approach to producing social order in the 'social space' with regard to the actors at UniUS: they imposed the institutions negotiated amongst themselves to the other actors in the network. From the quote above, it is apparent that this was the only alternative as their attempts to get UniUS to actively participate in the 'social space' did not work. This approach was not, however, effective in getting the 'thick' co-operation (i.e. co-operation characterised by 'complete trust') they required from UniUS to ensure collective action among them for the achievement of the common goals of the project (as shown below and discussed

in Chapter 8). Instead, UniUS showed 'thin' co-operation (i.e. co-operation due to the perception of trustworthiness) as they worked independently towards fulfilling their duties set out in the MoU without actively engaging with the other actors (e.g. contributing to the writing of the proposal and flagging problems when they arise so that a joint solution can be developed).

During the first year or so of the MozOptom DNO, a 'disconnect' existed between actors at UniUS and those at OptomNGO and NEuroIT. At that stage, each of the organisations plugged away in carrying out their responsibilities stipulated in the MoU, without much understanding of each other's expectations and the challenges they each faced (except for the relations between OptomNGO and NEuroIT).

7.2.2 The 'disconnect' between UniUS and the other core organisations

Key strategic decision makers in the DNO based at NEuroIT and OptomNGO reported that, during the first year or so of the project, they expected that the members of the DNO at UniUS would get the course up and running according to the time-frame agreed in the MoU. However, on travelling to Mozambique, they found out that there were some setbacks and due to some of the difficulties the university experienced, they were not able to fulfil their duties as members of the DNO. The major setbacks were: the university lacked the funds to build the optometry clinic that was intended for use as a teaching clinic for practical training on the course, the high levels of bureaucracy in Mozambique hindered the achievement of objectives, and a change in education law that prohibited universities in Mozambique from producing graduates below degree level. Thus, UniUS would not produce optometry technicians in addition to degree-level graduates, as promised in the project proposal approved by DevAid.

According to five of the seven members of the core teams at OptomNGO and NEuroIT, getting actors at UniUS actively engaged in the DNO was challenging. For example, they had difficulty lobbying to get the profession recognised in Mozambique in order to ensure jobs in the public sector for the students after they graduated. A representative at DevAid's office in Mozambique had also advised them to get the actors at UniUS, as 'locals', to take over the role of engaging with government as a more effective strategy (Interview, DNO Executive Management 3, DNO Core Management 1, DevAid 2). As Lawrence (2008) points out, control is difficult when direct surveillance is not possible and this situation increases the possibility of

avoidance behaviour. Hence, the interdependence of the actors in the DNO can be a benefit in that they share resources, etc. and they benefit from the complementarity of assets (e.g. necessary expertise), but it also means that the avoidance behaviour or delays from one side impacts on the DNO as a whole. The recognition of their interdependence and value placed on openness and commitment to the mission (i.e. their 'network consciousness') was most explicitly communicated by one key decision-maker at OptomNGO:

...I think some of the time delays may have cost us from his (the Rector of UniUS's) side..So, I'm not saying that we all didn't make mistakes, you know. Those happen in networks. I mean, and he's building a university, he can't be (laughs) on top of everything...

Due to the lack of bureaucratic and direct lines of governance in the DNO, which is typical of network organisations, network institutions become even more important for guiding behaviour. As Berger and Luckmann (1967) indicate, social mechanisms for control cannot be constantly employed to regulate behaviour and thus, internalised institutions are important. However, as reported above, the actors in the MozOptom DNO were not successful in negotiating shared institutions between UniUS and the other core organisations (NEuroIT and UniUS).

From the perspective of UniUS, all of the key actors described the first year of the DNO as very difficult as they had faced numerous challenges in order to fulfil their responsibilities as members of the DNO. These challenges included getting the course approved, recruiting students, implementing the curriculum, assisting in recruiting lecturers and a course co-ordinator, and providing the premises for the teaching and practical training(see Chapters 4 and 5). Since optometry did not exist in Mozambique at the time, fulfilling these responsibilities was challenging. As shown in Chapter 4, UniUS faced additional challenges as a new and under-resourced university located in an 'under-developed' relatively isolated region of Mozambique. Not having local expertise in optometry presented a further challenge.

Based on the discussion above, it is clear that a divide existed between the actors at NEuroIT and OptomNGO and the actors at UniUS. What was baffling to me was that this problem existed despite the fact that each of the core actors at NEuroIT, OptomNGO and UniUS emphasised open communication and transparency amongst themselves and expected the same from each other. They also had an open attitude to learning from their mistakes and

recognised that each organisation in the DNO depended on each of the other organisations. I refer to this as a 'network consciousness'. Some of the actors provided these responses when asked, in an interview, what they thought would be important for a successful network:

UniUS Management 2: Because resources are not that, so many...Communicate. That's important. That means working as a team.

DNO Executive Management 3: ...openness and transparency, um, is a big, big thing.

DNO Executive Management 1: I think the biggest thing is honesty. If you go to the table with a double agenda, it, eventually everything unravels.

It would thus be expected that the institutions of open communication and sharing of information and ideas would be shared in the development network organisation (DNO) as a whole. However, this was not the case.

7.3 Threats to co-operation and network resilience

In exploring this issue further in the interviews and fieldwork, I identified four major threats to the network, which resulted in tensions between actors at UniUS on the one side, and actors at NEuroIT and OptomNGO on the other. Two exogenous threats arose due to occurrences in the inter-related fields in which the MozOptom DNO was embedded (see Figure 15 above), and endogenous threats arose due to the ineffectiveness of a central actor in the DNO and incompatible management styles.

7.3.1 The first exogenous threat: DevAid's funding model

Key decision-makers in the DNO based at each of the core organisations reported that tension arose in the early stages due to DevAid's funding model. Reports on this issue were consistent across the reports from the interviewees based at the European and African organisations. This issue was reported by a key member of the DNO:

DNO Executive Management 1: And I must say that DevAid model does create some tensions, not between OptomNGO and UniUS, but between NEuroIT and UniUS because there is definitely a sense that developed in some of the early stages...that, you know, why do we have to like, it's like we have to ask for money to our boss, you know...And [the Principal

Investigator], I must admit, was trying to be as flexible as possible within that, but he's got to report to Dev Aid, you know...

The network structure of the DNO was embedded within the hierarchical structure of the larger DevAid programme. As indicated in the quote above, the funding model and monitoring and evaluation (M&E) strategy of DevAid complicated the relationships between the actors NEuroIT and UniUS. DevAid's M&E strategy required NEuroIT to report back on progress and thus held it accountable for the co-ordination and M&E in the MozOptom DNO. However, the actual work of the DNO was carried out through the network structure, but accountability (to DevAid) was channelled through the hierarchical structure (see Figure 3 in Chapter 1). As Burt (2001, 2005) indicates, this type of structure is a norm for organisations.

From a network-institutional perspective, we understand that institutions can be transferred between inter-dependent fields and are also transformed in the process. Furthermore, institutions are historical and they are embedded in the roles of actors (Berger and Luckman, 1967; Giddens, 1979; Padgett and Powell, 2012). Actors thus 'carry' institutions into the networks in which they interact (Owen-Smith and Powell, 2008; Padgett and Powell, 2012). The institutions associated with the roles of aid 'donors' and 'recipients' were 'carried' into the network structure of the DNO from the hierarchical structure of the larger aid programme. This hierarchical structure was produced and reproduced by DevAid (in collaboration with the HEA and the actors involved in the projects funded under the aid programme). The role of the Principal Investigator as the 'project lead' was produced in the hierarchical structure, and the historical institutions associated with unequal donor relations were embedded in this role. The Principal Investigator then utilised a range of social skills in interaction with actors within the DNO in order to present himself as a 'network member' in order to facilitate co-operation among actors in the DNO. Long (2001) indicates that, in development projects, local actors' (i.e. the 'recipients' of aid) perceptions of development workers are often informed by their previous experiences with development workers and the perceptions persist despite the efforts of development actors to change it.

A ramification of this set-up is the perpetuation of the legacy of unequal donor-recipient relations within the DNO. One of the strategic decision makers at UniUS stated: '...it's very hard to discuss that because, er, they are donors of the, the project, you know' (Interview, UniUS Management 6). This resulted in UniUS treating challenges they experienced (e.g.

obtaining a suitable curriculum, recruiting students) as their (organisational) problems and not that of the DNO, even though these challenges hindered the achievement of the common goals of the DNO. Four of the five strategic decision makers at high level management at UniUS reported that they viewed OptomNGO and NEuroIT as the 'donors' of the project. They complained about their lack of control over the decision-making about how the budget was spent and how the project was implemented. This perception persisted even during the third year of the MozOptom DNO.

7.3.2 The second exogenous threat: restrictions in the Education Law in Mozambique

The second major threat to the DNO that complicated relations among the actors at the core organisations was the fact that UniUS would not be producing optometry technicians. Major changes in the Ministry of Education and Education Law negatively impacted on the DNO. All of the strategic decision makers at OptomNGO and NEuroIT reported being disgruntled by this situation. It meant that NEuroIT would not deliver on the key deliverables of the project, that is, the implementation and evaluation of a multi-level optometry training programme, as per their agreement with DevAid. OptomNGO would not be able to pilot their multi-level training model and compare the experience of piloting the programme in Mozambique to the other pilot programmes they conducted in Southern Africa. They were particularly disgruntled by the fact that the university had not flagged the issue earlier and had not engaged with them in putting forward alternatives for achieving the common goal of the DNO. Two quotes from interviews with these key strategic decision makers describe perceptions of this issue:

DNO Executive Management 1: Er, I hoped that we would get out of it not just the benefit for Mozambique, that if we did a proper multiple entry and exit we could've shared that information more broadly about how do we approach this in Africa, er, etc. That's not gonna happen.

DNO Executive Management 3: ...I think our big problem before then, we just weren't informed because we had no one to deal with. Um, so, we were, you know, plugging away with things that we saw we, were needed to be done, and UniUS either didn't, you know, didn't understand where we were coming from or didn't see the importance of it or whatever it happened to be. Um, but that's why, that's why things broke a little bit.

The quote above also highlights the problem of not having developed the necessary shared institutions to guide behaviour and facilitate co-operation among all of the key actors in the DNO.

7.3.3 The first endogenous threat: an ineffective bridging actor

The DNO members reported that the strong bonds they formed with some of the other members facilitated their interaction and co-operation (e.g. Coleman, 1988). However, before this condition was reached, effective linkages across the organisational divides had to be developed. In the mainstream social capital literature there is a tendency to emphasise the role of bonding social capital and a tendency to imply that more social capital is always better for co-operation, which has been fiercely criticised recently (e.g. Serra, 2011).

The need to bridge the divides between the organisations was recognised from the very beginning, indicating a 'network consciousness'. This is shown by the fact that the communication strategy implemented since inception was to have a core team in place at each of the key organisations in the DNO – NEuroIT, OptomNGO and UniUS – and recruit an individual to act as a Network Manager to co-ordinate DNO activities in Tizangara. The Network Manager was also expected to act as a conduit for communication between the actors at OptomNGO and NEuroIT and actors at UniUS.

Interestingly, a disconnect between the actors at UniUS and actors at the other organisations existed in the beginning despite the fact that the 'space' between the organisations was not a structural hole as interaction between the key project members at these organisations took place. Besides e-mail communication, the two strategic decision makers at NEuroIT reported relatively frequent face-to-face meetings with actors based at OptomNGO and actors at UniUS. The Principal Investigator travelled to Africa as often as once every six weeks during the first year of the project, and later reduced the frequency to two to four times a year. This result indicates a flaw of structural network analysis. The existence of ties does not automatically mean that useful information and resources are shared along those ties. Qualitative analysis is necessary to investigate what *actually* happens between two actors who are connected.

This scenario highlights the problem of an ineffective bridging actor. The first Network Manager was described as ineffectual as a link, as a key actor in the DNO stated:

DNO Executive Management 3: ...our initial (Network Manager) was [a Mozambican], had a close relationship already with UniUS. Um, that created difficulties for us because, er, it was difficult, it was difficult for him to approach UniUS with problems....

Eighty per cent of the key members of the DNO across the three core organisation also raised the challenge of not having an effective link or bridge between UniUS and actors at NEuroIT and OptomNGO in the beginning. As revealed in the quote above, the first Network Manager was a local person who had a good relationship with the actors at UniUS. The actors at NEuroIT and OptomNGO thus expected that he would have been able to effectively coordinate DNO activities in Tizangara, which centred around UniUS at the time, and facilitate co-operation from actors at UniUS. As indicated in the quote above, the bonding social capital that he possessed actually hindered his ability to act as a key channel of communication and resource flows between NEuroIT and OptomNGO (i.e. the external partners) on the one side, and UniUS on the other. The structural position that the Network Manager held in the network required him to process information he received, and direct and transmit information to the appropriate actors. Another part of the job was to facilitate the sense-making process in the network. The first Network Manager was not, however, able to effectively communicate the expectations, needs and challenges of the external partners to the actors at UniUS, and vice versa – which was necessary for developing shared meanings and institutions among the actors in the DNO. This was another reason for the tensions in the DNO during the initial stages (see earlier).

7.3.4 The second endogenous threat: conflicting management styles

It is commonly thought that cultural filters or cultural frames help individuals encode and decode messages closely to the way they were intended. Thus, if individuals are not familiar with the cultural frames for decoding the messages, they use their own cultural frames, but in doing so, often interpret the messages incorrectly (see Luring, 2011). However, miscommunication and lack of communication between individuals of different cultures also occur due to differences in management styles, and differences in the cultural perceptions of structural positions in the network and the responsibilities associated with the different structural positions (Kim and Mattila, 2011; Luring, 2011). Expatriates thus often come across as ethnocentric.

Another reason for the lack of engagement in the DNO during the initial stages is the mismatch between the results-driven approach of actors at OptomNGO and NEuroIT, and the 'slow' approach of actors at UniUS. In the MozOptom DNO, the external partners at OptomNGO and NEuroIT displayed results-driven management styles and expressed impatience with the bureaucratic processes, which slowed the achievement of the objectives of the DNO. They found the culture frustrating as it resulted in delays in DNO activities and the achievement of goals. One of the key actors said that he found it a waste of time to wait around for people to show up for meetings and so, he stopped scheduling meetings with staff at UniUS other than the optometry lecturers, Training Co-ordinator and the Rector with whom it was absolutely necessary to meet to discuss issues related to the MozOptom DNO. This attitude among foreigners and expatriates from Europe was found by other researchers as well. For example, Luring (2011) conducted ethnographic research of intercultural communication in the local setting of a multinational company's subsidiary. He found that expatriates tended to be focused on 'creating measurable results, such as improved sales numbers'. They described intercultural communication as slowing down decision-making processes. They then tended to limit communication with employees from other cultures.

Rather than facilitate co-operation, the co-ordination style of those actors actually achieved the opposite: resistance. The co-ordination style hindered the building of bridging and bonding social capital between actors at the level of management at UniUS and actors at NEuroIT and OptomNGO. Local actors at UniUS complained about the European actors demanding that things be done a certain way and not being open to negotiation. A quote from an interview with two of the key decision-makers at UniUS shows this perception:

UniUS Management 4: ...we all believe that things need to be contextualised and not be copied, like, well, you have to implement like that. You have to contextualise the things because otherwise you will jeopardise all the programme and people will not be, um, they will not be with you.

As discussed in Chapter 4, when dealing with challenges related to traditional institutions prevalent in the local communities, management at UniUS employed a strategy of working within the existing hierarchical social structures and institutions in the local communities rather than trying to rapidly change existing systems. So, they worked within the system to effect change slowly. The Training Co-ordinator and senior lecturers in the optometry

department utilised the same approach (see Chapter 5). They explained that, in this way, they gained access and acceptance and developed trust with others in the local setting. They thus approached each other and the wider social context differently to the way in which the actors at NEuroIT and OptomNGO approached the context.

Fligstein and McAdam (2012) indicate that working within the system and taking what the system gives is one of the social skills skilled strategic actors utilise for bringing about co-operation, particularly in stable fields. They state that these strategies are often utilised by skilled strategic actors in dominated groups (challengers). The actors at UniUS were the challengers in relation to the actors at NEuroIT and OptomNGO, so Fligstein and McAdam's (2012) framework fits that scenario. It does not, however, explain the scenario where actors at UniUS interact with the local communities as they would be the dominant actors in that context. It also does not explain the social skill of the Training Co-ordinator who was affiliated with the NEuroIT-OptomNGO hub in the MozOptom DNO and was one of the dominant actors in the field of UniUS. Fligstein and McAdam (2012: 51) do, however, state that skilled strategic actors 'understand the ambiguities and uncertainties of the field and work off them' and (t)hey have a sense of what is possible and impossible'. The local actors at UniUS showed this understand and thus chose to employ social skills that they found more appropriate for facilitating co-operation in order to bring about social change. The same applies to the Training Co-ordinator. In the instances that she did not have the necessary tacit knowledge to draw on empathy in her social strategy, she would 'go out of herself' in order to learn the necessary tacit knowledge or institutions to devise an effective social strategy. Berger and Luckmann (1967: 77) refer to this process as 'externalisation'. The 'slow' strategy has also been highlighted by development researchers as a more effective strategy to effect social change than the results-driven approach that focuses on trying to effect radical change (e.g. MacLachlan et al, 2010). The European actors were, however, the actors in the DNO who were made accountable to DevAid. Their roles in the DNO, stipulated by DevAid, required them to focus on measuring results in order to ensure that the DNO achieved its common development goals and thus delivered on their promises. Hence, their social strategies, in terms of the possibilities available to them, were also constrained by their roles. Also, this is another example of institutions embodied in the roles of the 'aid workers' being 'carried' from the field of the larger aid project, which is embedded in the field of development assistance, into the DNO.

The results-driven approach of the skilled strategic actors of the dominant group (the incumbents) were ineffective in facilitating co-operation, and tensions culminated in a 'big fight' that presented a turning point in the lifecycle of the DNO.

7.4 The 'big fight', an institution building 'moment'

Tensions arose after the first year of the MozOptom project when the members of the DNO at NEuroIT and OptomNGO found out that UniUS would not produce graduates below degree level as stipulated in the project proposal approved by DevAid. This meant that the DNO could not produce the deliverables promised in the project proposal. To address the problem, the Principal Investigator and Network Manager called a (face-to-face) meeting with key members involved at the level of management at UniUS. This meeting was described as a big 'fight' by three of the five key actors based at UniUS who were involved in the DNO. They described the interaction as a 'fight' because the situation was characterised by 'tension' between the actors involved. Due to concerns of not delivering on the project, the approach of the key actors at NEuroIT and OptomNGO was to put an ultimatum to the members at UniUS that they co-operate or lose the funding. In an interview, one key project member described the situation:

DU_1: Um, the, er, so, it actually came to kind of a head at one point where, um, NEuroIT and OptomNGO threatened to pull the plug on the programme in UniUS, um, simply because...they weren't engaging with us at all in terms of the problem with the two-year graduate, um, how to solve that, um, issue; the problem with advocacy for, for the programme; getting the curriculum approved.

This quote shows the intent of sanctioning UniUS by the more powerful organisations in the DNO. NEuroIT and OptomNGO have greater power in the DNO in that they have greater control over the project funding and are less dependent on the project funding for their core activities. This example shows how the ability to sanction behaviour depends on relative position within the network, and how those with less power feel coerced to co-operate because of their position in the DNO (see Serra, 2011). Actors exert power differently depending on their structural position (Serra, 2011) and symbolic power (Hallett, 2003).

In response to this conflict situation and the threat to sanction behaviour made by NEuroIT and OptomNGO, the DNO members at UniUS resisted. In the words of a key DNO member, 'They were pushing back'. They stated unequivocally that they would not produce graduates

at the technician level as the new law in the country did not allow them to do so (see Chapter 4). The key actors at OptomNGO and NEuroIT reported being disgruntled by the fact that UniUS did not indicate earlier that they would not be able to produce optometry technicians. According to them, the problem arose due to a recent change in Education law in the country.

Not reporting their inability to produce a key deliverable of the DNO to the other core organisations in the DNO can be seen as avoidance behaviour which is a form of resistance (see Lawrence, 2008). Resistance can also be seen as a form of sanctioning (Giddens, 1979).

The dispute was resolved during a meeting involving the high-level decision makers in the DNO. This situation presented an institution-building moment in the MozOptom DNO. Here, the skilled strategic actors at each of the core organisations played a major role in ensuring the continued existence of the DNO. Fligstein (2008: 230) indicates that:

(i) Institution building moments occur when groups of social actors confront one another in some set of social interactions that are contentious. These moments are inherently political and concern struggles over scarce resources by groups with differing amounts of power.

A key member of the DNO described what happened in the meeting:

DNO Executive Management 3: Um, so, [so there was] a roundtable discussion with [the Principal Investigator], [the Director of OptomNGO] and, and [the Rector of UniUS]. Um, and where ultimately it was, you know, decided, either we do things a lot differently or we take the programme elsewhere, and that being elsewhere in Mozambique...or that we, you know, relook at the Memorandum of Understanding and, um, try to be more rigorous with sticking to the individual partner responsibilities. Um, so, although I don't think [the Rector of UniUS] was happy with things as they stood then, I think...he didn't want the programme to be abandoned, if you like, so he came on board for it.

As indicated in the quote above, considering the costs (to each of the organisations) of abandoning the MozOptom DNO, a compromise was reached. It was decided that the DNO would continue to develop the training programme at UniUS and that the programme would

produce optometry graduates at the degree level only. It was decided that the DNO would try to find another way to fulfil the objective of producing graduates at the technician level. The Memorandum of Understanding (MoU), which embodied the collective identity and formal institutions of the DNO, was renegotiated and a new MoU was signed.

This conflict situation was a turning point in the life of the DNO. At that point, the DNO could have been abandoned, but a compromise was reached. The common goals of the DNO and roles of each of the actors were renegotiated. This was the first time, since the proposal-writing stage, that the actors at the three core organisations met and openly negotiated the common goals and institutions of the DNO. One of the key actors reported specific network institutions that were negotiated amongst the core actors:

DNO Executive Management 3: Um, so, I think that formed part of the discussions that we had with, with [the Rector], about how to try and improve things, that we would, I suppose, be open in terms of what our motives were and justifications for doing certain things were. Um, as long as they kind of would commit to kind of, you know, flagging problems where there were problems at the time rather than kind of, you know, letting us go down a certain track and thinking that things could be done and then to find out at the very end that they couldn't be done.

Also indicated in the quote above is that, while UniUS was dependent on OptomNGO and NEuroIT for the financial resources and optometry expertise for developing the optometry department at the university, the other two organisations were dependent on UniUS to co-operate in order to successfully achieve the main goal of the DNO (to develop an optometry school in Mozambique). Starting the project with another higher education institution (HEI) in Mozambique would mean that the resources already used, would be wasted. It would also mean that delivering on the objectives that were agreed with DevAid would be delayed. Similarly, the organisations were dependent on the funding agencies to provide the bulk of the funding to develop optometry capacity in Mozambique. The funding agencies in turn were dependent on the DNO to co-operate and successfully deliver on the project so that they could show success in their development initiatives in order to reinforce their legitimacy (see Mosse, 2005). If the MozOptom project failed to deliver, it would be reported as a failure of DevAid. This indicates interdependency among the organisations involved in the MozOptom project, which is typical of networks. However, as Barabasi (2002) indicates, in all networks,

some central actors tend to have greater influence than others. Due to the lack of financial and knowledge (optometry expertise) resources available locally to UniUS, the actors at the UniUS held less power in the network in that sense.

7.5 Strategies for facilitating co-operation

7.5.1 Selecting actors according to the current needs of the DNO

The key strategic decision makers in the DNO who were based at NEuroIT indicated the recognition that an effective link between the organisations was essential for facilitating co-operation through acting as a key channel of communication as well as in identity formation in the project. When the first Network Manager resigned during the first year of the project, the key members of the DNO based at NEuroIT took the strategic decision to recruit a new Network Manager who they thought would be better able to bridge the divide between the organisations. They then recruited an individual from Europe who had project management experience. This situation is described in the quote:

DNO Executive Management 3: ...we took the deliberate decision to take someone from outside, um, who would be, um, completely independent of the programme.

The practice of recruiting expatriates to live in the country where project offices or subsidiaries (in the case of multi-national companies) are based, to act as a bridge facilitating communication and knowledge sharing, is ubiquitous in business (e.g. Luring, 2011) and development practice (e.g. MacLachlan et al, 2010). Expatriates are expected to learn the local culture and share knowledge of their culture with the locals. In this way, they learn from each other (Luring, 2011).

Although this finding seems intuitive considering that the MozOptom DNO consists of four different types of organisations located in different countries, this decision went against the philosophy of OptomNGO, which emphasised the need to recruit a local person as the Network Manager as it provides an opportunity to empower local people. Also, recruiting local persons is 'cheaper' as locals tend to have their own social networks and would be familiar with the context and speak the language. A key decision maker at OptomNGO communicated this perception:

I think that, er, we had a disaster because one of the, we wanted to have a Mozambican to head the project, and the guy we had left after a short while...(the Principal Investigator) and (the Network Co-ordinator)...they came back and recommended that we employ (the Network Manager) in that role. And, you know, the arguments they put made sense. It's not usually the route we go...

Some of the key actors at UniUS also disagreed with this decision as it was perceived as a practice of spending development funds for the benefit of 'donor' countries. Over tea one day, one of the key decision-makers at UniUS complained about the use of international aid, by international NGOs, for the benefit of their own people:

UniUS Management 2 told me that NGOs came in and ran programmes in Mozambique without consulting with the local people. They didn't use local people or local materials either. They often sent in inexperienced people to run the projects. He asked, "What is wrong with how Mozambicans do things?"...He also said that the way in which the projects were marketed was problematic. I wasn't sure what he meant by this so I asked him to explain. He explained that they marketed themselves overseas and asked people for money for development in Africa. But then when they implemented the projects, most of the money went to pay their own people. (Field notes, 17 May 2011)

This perception was not, however, held by all of the key actors at UniUS. For example, in an interview, one key decision-maker at UniUS reported that the fact that the new Network Manager was 'from the project' and 'lives in Mozambique' was beneficial for UniUS as they soon began to see improvements in the optometry training programme (Interview, UniUS Management 6). Having 'someone from the project' live in Tizangara also meant that the actors at UniUS could access 'the project' more easily. This quote also shows how the role of the Network Manager in the DNO was closely tied to the identity of the DNO. He became the DNO's key contact in Tizangara and his office was the DNO's office.

The Network Manager managed to bridge the communication divides between the core organisations by facilitating the development of trust between the organisations by making them feel that their expectations and needs were being met. He acted as a key channel of

information between them, conveying each of the core organisation's needs and expectations to each of the other core organisations. During the fieldwork, I observed how he would communicate back and forth between key actors at the core organisations, either virtually (sending e-mails and communicating via Skype) or in face-to-face meetings with the members of the teaching team and other actors at UniUS. The key actors at the level of management at UniUS also reported that he was their key contact with the other actors at NEuroIT and OptomNGO. The central role he played in the DNO was also identified in the structural network analysis discussed in Chapter 6.

How did he manage to bridge the divides between the core organisations? According to Fligstein and McAdam (2012), in inter-organisational fields (like the MozOptom DNO), a major task for skilled strategic actors at the intersection between the organisations (i.e. bridging actors) is to fashion shared meanings and a collective identity that resonates with other actors in the field. In this way, bridging actors are able to facilitate co-operation among actors in the field. In the MozOptom DNO, the Network Manager was hired specifically to act as a 'neutral' actor and fashion a 'project identity' in order to get actors at all of the core organisations to co-operate with each other for achieving the common goals of the DNO. This is discussed next.

7.5.2 'DNO identity' and the role of the Network Manager

Since social mechanisms of control rather than bureaucracy are important governance mechanisms in development network organisations (DNOs), 'it becomes important to have an internalised cognitive structure of what the organisation stands for and where it intends to go – in short, a clear sense of the organisation's identity' (Albert et al, 2000: 13). I found the integration between understandings of 'identity' in network theory and new institutionalist (field) theory useful. From a network-institutional perspective, identities provide actors with meaning, a sense of belonging, and a guide as to how to behave in specific social contexts (Fligstein and McAdam, 2012). Individuals hold multiple identities, which are embedded in their position in a network structure and are activated by the signals and stories embedded in language (Mische and White, 1998: 703-704). Furthermore, two kinds of identities exist: personal and collective (Tajfel, 1959, 1969 in Brickson, 2000). According to Tajfel's social identity theory, which is utilised most in the organisational literature, when individuals' personal identities are salient, they are motivated more by self-interest and think of themselves mainly in terms of their own personal characteristics and traits (Brickson, 2000).

Whereas, when their collective identities are more salient they conceive of themselves in relation to others and are motivated by collective goals. Collective identities are thus essential for co-operation and skilled strategic actors in networks play a crucial role in getting actors to co-operate by fashioning identities with which they resonate (Fligstein and McAdam, 2012).

As an 'independent actor', the Network Manager was described as representing 'the project' rather than any particular organisation or organisational identity. His role within the DNO was tied more to the collective identity of the DNO. He thus supported the formation of a 'project identity', which is essential for effective co-ordination of communication and action. This perception was communicated by the key actors at OptomNGO and the lead institution as well as one of the key actors at UniUS. A core project member explained:

DNO Executive Management 3: And (the second Network Manager) very much represents the project, not the partners, even though he's kind of employed by OptomNGO and his salary's paid for by DevAid...

The fact that the Network Manager was from Europe, is affiliated with OptomNGO and has been based in the African country since he accepted the job, has allowed him the opportunity to understand the realities in which the different organisations are located, that is, develop the necessary tacit knowledge. He drew on these multiple identities in framing issues that come up. This is a big part of the social skill he utilised in facilitating co-operation within the network, as described by one of the other central actors in the DNO:

DT_U: he always would position himself as someone who's independent of all partners. Um, so, he would, you know, he would always get [the African university's] perspectives and make sure that [the others] aware of them, and that was our, I think our big problem before then...

It is apparent in the quotes above that the need of the 'network' was to get someone who could build the necessary linking social capital facilitating communication and information sharing between NEuroIT and OptomNGO, on the one side, and UniUS, on the other. The individual would also need to co-ordinate DNO activities on the ground in Mozambique. Essentially, as described in the quotes above, the bridging actor had to be able to understand the needs and expectations of each of the organisations and communicate these in such a way that each could understand. Bridging actors thus had to have knowledge of each context. The

Network Manager recruited was an expatriate who was based in Tizangara, the local context, as this would provide them with someone on the ground who was familiar with the context. Since he had worked for international NGOs in eye care before and the context of OptomNGO was similar to that of NEuroIT, he was able to identify with the actors at OptomNGO as well. In framing each side's expectations and needs, he had to encode them into categories with which they could relate drawing on tacit knowledge of their life worlds and using empathy (Fligstein and McAdam, 2012; Padgett and Powell, 2012). Messages received from each side had to be encoded, drawing on their respective cultural frames, before passing them on. In this way, each side could better understand the other side. This was not, however, an easy task.

For one, he did not speak the local language when he first took the job. Furthermore, although the Network Manager was supposed to be an independent actor, he was formally affiliated with OptomNGO (as an employee) and was described by key project members at all of the core institutions as representing 'the project'. Since the actors at UniUS perceived the project as mainly constituting an alliance between OptomNGO and NEuroIT, he was seen by them as representing NEuroIT and OptomNGO.

Although the Network Manager was formally affiliated with OptomNGO, his main job was managing the MozOptom DNO. This understanding was held by all key actors. However, when the programme manager at OptomNGO left and a new manager took over the role, a misunderstanding arose as to how much OptomNGO-only work (not related to the project) he was expected to do and how much control the manager at OptomNGO had over his schedule.

Two actors involved in the situation complained about the tension caused by the high staff turnover at OptomNGO, which changed the dynamics of relations as the actors newly introduced to the network had to learn about the roles of each actor and new norms for interaction had to be negotiated. With regard to the conflict that arose when the new programme manager at OptomNGO joined the network, a telephonic meeting was arranged to solve the conflict. Actors included in the telephonic meeting were the sub-Regional Programme Manager at OptomNGO, the Director of OptomNGO, two other key decision-makers at OptomNGO, the Network Manager and the Principal Investigator. The situation was described by a key project member:

DNO Executive Management 3: Um, so there was issues around our trip in March last year where we had a whole schedule for (the Network Manager), um, (the programme manager at OptomNGO) had a very different schedule for (the Network Manager) fixed. Um, and so there ended up being a bit of tension there. Um, but it has got resolved through, we had a group teleconference...

This scenario also highlights the importance of openness in addressing conflict and joint problem-solving among the actors, at OptomNGO and NEuroIT in this instance, in facilitating co-operation. Openness and joint problem-solving as well as joint decision making are crucial in DNOs (see Holohan, 2005).

As shown in the structural network analysis in the previous chapter, the second Network Manager was generally considered a central actor, playing a vital role as a bridge between the different institutions. All of the project members involved in the project, from the first year of implementation, indicated that communication among the members of the DNO improved significantly after the arrival of the new Network Manager. One key actor at NEuroIT stated in an interview:

DNO Core Management 1: So, yah, since then (the new Network Manager) arrived in Tizangara, things have been going a lot, a lot better and we've had better communication with UniUS...

The dominant role that the actors at NEuroIT played in influencing decisions is apparent in the discussion above. The decision taken in this instance was effective in reproducing their position in the DNO (see Fligstein and McAdam, 2012). However, the decision was in the best interest of the DNO. Hiring a local person for the job of Network Manager was found to be an ineffective strategy. They thus took a decision in the opposite direction, which was found to be effective. Soon after the strategic action field stabilised towards the end of the third year of its existence, the Network Manager left the DNO as his contract had ended. He had managed to build the necessary bridging and linking social capital required for facilitating co-operation in the DNO. The needs of the network have changed since then and thus the role of the Network Manager has changed. Key actors in the DNO reported that the new Network Manager would need to be able to speak Portuguese and be familiar with the political institutions in Mozambique as the main task at hand now is to advocate for the official

recognition of the optometry profession (and thus the emerging optometry professional community) in Mozambique.

7.6 Conclusion

In this chapter, I conducted micro- and meso- analyses on the 'inner workings' of the MozOptom development network organisation (DNO). The framework illustrating the key characteristics that were required for co-operation in the DNO is presented in Figure 15 in the introductory section of this chapter. The findings discussed highlight the importance of developing shared institutions and a collective identity for co-operation in the DNO. These processes were, however, complicated by several endogenous and exogenous factors that hindered the institution-building processes among the actors involved in the DNO, which resulted in a fragile social order. Exploring the impact of other institutionalised fields in which the DNO was embedded was crucial for understanding interaction and power relations among actors within the DNO.

The discussion of the findings highlighted two major problems with the 'development model' utilised in the DevAid Programme of Collaboration under which the MozOptom DNO was funded. One problem was the funding model, which led to the introduction of institutions traditionally associated with 'donor-recipient' relations into the DNO network. The second problem was the results-driven management strategy and the institutions associated with this strategy, which is typical in the field of development assistance. The strategy was shown to be inappropriate for facilitating 'thick' co-operation, that is, co-operation based on strong commitment and loyalty. The management strategy also negatively impacted on the relationships between the European actors (mainly) and the African actors at UniUS. The actors at UniUS complained about the actors at NEuroIT prioritising the achievement of certain DNO-related objectives (e.g. piloting the use of standardised teaching materials) over the needs of the students at UniUS (e.g. providing textbooks in Portuguese). The discussion thus highlights two areas where improvements in development practice can be made.

The discussion also elaborated on the impact of power dynamics on co-operation in the DNO. Power dynamics related to structure were identified in the structural network analysis presented in Chapter 6. The structural analysis identified central actors in the network and showed the density of the network. The results were confirmed and elaborated on by the qualitative analysis. I argue that the structural network analysis is useful, but shows only half

of the story. For example, identifying a bridging actor within the network is important for understanding the opportunities and constraints presented by the network structure (i.e. what resources actors are able and unable to access directly and indirectly). The understanding of the role that the bridging actor plays in the DNO is, however, incomplete without an analysis of the social strategies the actor employs in that role and the effectiveness of those strategies. With regard to bridging actors in particular, the analysis showed that the roles of bridging actors depend on the stage of the DNO (e.g. emergence) and thus the needs of the network at the time. Also, the social skills that actors utilise are related to their role in the DNO.

Furthermore, the conditions of having similar values and meanings are not sufficient for ensuring co-operation, at least not without meaningful exchange among the actors (i.e. the negotiation of shared institutions). Also, without true shared authority over how the money is spent, equal status within such 'North-South' networks is not possible. Interestingly, control of the financial resources was not the only means of power in the network. Another currency of power is the dependency of each of the organisations, including the funding agencies, on each other for the success of the MozOptom 'development project'. Actors exert their power differently according to their relative status and position within the network. Hence, the identification of the options available to each of the actors in the DNO is important for understanding the power dynamics. Also, the inter-dependency among the actors weakened the power of dominant actors.

Another significant finding of the research is that, with this type of network – that is, a transnational inter-organisational development network –, linking across horizontal and vertical relations is required before establishing strong ties for stronger cohesion and co-operation among project members. This is important as communication has to transcend geographic, cultural (social context and organisational), and language differences. Also, although recruiting local individuals to co-ordinate development projects is often preferred practice, in a DNO it is important that the needs of the position within the DNO define the characteristics of the individuals employed. The different currencies of power and the role of trust are discussed next.

Chapter 8 Power and trust in the development network organisation

In Chapter 7, the impact of power and trust on co-operation in the MozOptom development network organisation (DNO) was highlighted. In this chapter, I elaborate on the different currencies of power in the DNO. The currencies of power in the network are firstly identified, followed by a discussion on each. Lastly, the role of trust is discussed, followed by the conclusion.

8.1 Definition and currencies of power

Different definitions of power exist. From an institutionalist perspective, power is not a commodity but a relational dynamic (Lawrence, 2008) and the rules or institutions of the field are embedded in power relations (Fligstein, 2008). In all fields some groups of actors tend to have greater influence in shaping network institutions, common goals and the distribution of resources. The group of actors defining which resources are important, and controlling access and the distribution of resources are in a better position to reproduce their positions in the field (Fligstein, 2008). However, power implies more than hierarchical lines of control and the control over resources. As Long (2001: 71) indicates, 'It is the outcome of complex struggles and negotiations over authority, status, reputation and resources' amongst network members. All actors, regardless of status, have the capacity to process their experiences in interaction with others and develop strategies for responding to the actions of others, even under conditions of coercion (Long, 2001). Thus the actions of actors in the field influence behaviour in the field, and those with less power also influence the field. An analysis of power dynamics is thus essential in the analysis of institutions and fields, and analysing how institutions and resource distribution are negotiated is essential for understanding power relations.

Furthermore, power is multi-dimensional (Lawrence, 2008) and multiple models of power exist in fields (Long, 2001). In the MozOptom DNO, three currencies of power operated in the network: 1) control of the financial and knowledge (local context and optometry) resources, 2) the dependency of each of the institutions, including the funding agencies, on each other for the success of the project, and 3) power related to language. Underlying these currencies of power are 1) the unequal relations and socio-cultural differences inherent in aid-funded 'North-South' development projects, and 2) the general issues of power found in all social networks due to the inevitable presence of hubs or central actors (see Barabasi, 2002; Watts, 2003).

8.2 Inter-locking 'development projects' and inter-dependency

According to Long's (2001), a 'development project' is 'a complex set of evolving social practices and struggles' rather than a discrete intervention with defined time and space boundaries. Also, each actor involved in development projects have their own 'development projects' and they work to ensure that the larger project benefits their own projects in some way. Similarly, development network organisations (DNOs) can be seen as including the interlocking 'development projects' of the actors involved in the DNO (see Figure 16 below). Considering that the development of a common mission is essential in DNOs, it is important to analyse how actors negotiate between the priorities of their own 'development projects' and that of the DNO.

As indicated in the previous chapter, OptomNGO initiated links amongst the core organisations in forming the DNO. Each organisation was selected according to the contribution it could make to achieving the main goal of developing capacity for optometry services in Mozambique. OptomNGO came up with the innovation and had expertise for developing optometry capacity in sub-Saharan Africa. UniUS provided the location and physical facilities for the optometry training programme. OptomNGO and UniUS, both 'public-good' organisations, could not produce the programme without adequate funding. The DevAid Programme of Collaboration between Higher Education Institutions (the PCHE) provided the opportunity to access the necessary funding. DevAid, however, stipulated, as a condition of the funding, that an HEI in NEuro act as the lead institution. OptomNGO thus initiated ties with NEuroIT as it was an HEI in NEuro and had an optometry department. The funding could thus be accessed through them. NEuroIT could also contribute in terms of expertise in optometry education and services. NEuroIT then brought in NEuroUni in order to enhance the research component of the proposal for funding as research was emphasised in the PCHE funding call. NEuroUni is a renowned traditional research university in NEuro and it had an optometry department. This shows how the network logic of including and excluding actors based on their contribution to the network informed the formation of the MozOptom DNO.

The inter-dependence of the organisation of the MozOptom DNO is illustrated in Figure 16 below. The joint activities between the organisations are indicated by the overlapping areas. The power that the alliance between the two organisations, NEuroIT and OptomNGO, has in the DNO was discussed in the previous chapter.

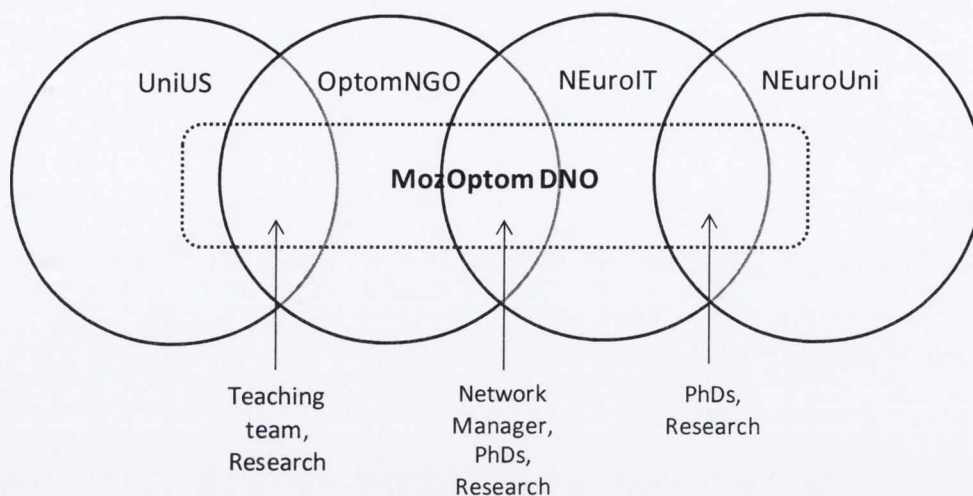


Figure 16 The MozOptom development network organisation as 'interlocking fields'

Note: The area within the 'dotted' lines represents the development network organisation (DNOs).

8.2.1 The 'development project' of OptomNGO

For OptomNGO, the main motivation was to pilot a multi-level optometry training programme in a Lusophone country. This was an innovation in eye-care training created by the Director of OptomNGO. As an international NGO, they were embedded in a competitive development environment. They described themselves as being a sustainable organisation in the sense that they were not as dependent on external funding as many other NGOs. However, as a relatively small and young international NGO in eye care, their survival depended on their relevance and impact. An innovation such as the multi-level training programme would not only reinforce their legitimacy, but may raise their status, as they were creating a niche in development eye care. One key actor at the level of management at OptomNGO described the instrumental use of the 'development project' of the DNO for them:

And because it's research they thought it would be good for them to, so, I said to them, look, what I think is that there's debate around this approach and optometry training in Africa. What we need to do is to test a pedagogical model and, but, really, we need the programme, we need the money for the programme, you know. But DevAid's not (going to) give you the, but let's use then this opportunity to test a pedagogical model.

Although they did not get to pilot the multi-level training model in Mozambique, they did manage to pilot the use of a standardised curriculum in Mozambique. The implications of this 'development project' on the development of the optometry training programme at UniUS, is discussed in Chapter 5.

8.2.2 The 'development projects' of the European organisations

In the MozOptom DNO, the main interest of the funding agencies was to confirm and reinforce their legitimacy as aid agencies in order to receive more funding. They were accountable to the taxpayers of the country and thus had to work towards showing positive results and impact in order to continue to exist (see Mosse, 2005).

DevAid's PCHE was the first large-scale aid-funded programme that attempted to get higher education institutions (HEIs) in NEuro involved in development at an institutional level. HEIs interested in participating had to co-ordinate the development initiatives of their individual staff in order to submit an institutional proposal for funding. Incentive was also provided for collaborating with other NEuro HEIs. HEIs collaborated and competed against each other for the funding. Receiving the funding was seen as an achievement and an indication of the quality of the HEI. Key contacts of the projects funded under the PCHE described the politics within and between the HEIs in competing for the funding. A key contact of one of the other projects described the politics, at a university in NEuro where he worked, during the proposal writing stage:

Other Project Contact 1: ... it was good money, you know, at a time when sometimes good money is hard to come by, it meant that people traditionally involved in, in sort of, um, development, you know, were being ousted by people who weren't traditionally involved in development. So, there was a rift, you know, a dash for the cash...The politics was horrendous.

Hence, for NEuroIT and NEuroUni, receiving the funding raised the research and development profiles of their organisations. NEuroIT is an interesting case in NEuro as it has struggled to achieve legitimacy as a university. According to the OECD's (2004) review of the higher education sector in NEuro, although NEuroIT engages in research and produces significantly more graduates at PhD level than other such HEIs in NEuro, NEuroIT has still not received recognition as a university despite its petitioning in this regard. NEuroIT has, however, been

given special status due to the high number of PhD graduates it produces. Considering the competitive process of applying for the funding, it was an achievement for NEuroIT to have their proposal accepted. Recently, NEuroIT has added a 'development agenda' to their mission, which adds to their status in the higher education sector in NEuro. Initiatives like the MozOptom DNO, supports the development of the agenda.

8.2.3 The 'development project' of UniUS

For the actors at UniUS, the 'development project' of the DNO was *an aspect* of their own 'development project' of managing and expanding the university. Ensuring that the training programme operated as a fully functioning academic department at the university was their priority. The actors at NEuroIT and OptomNGO, however, treated the development of the optometry training programme as a separate development project or a project on its own. Hence, the actors at OptomNGO and NEuroIT participated in the DNO to 'do development', whereas the actors at UniUS participated in the DNO simply as a means to grow the university in a shorter time-frame than they would have achieved without the externally-sourced funding and expertise.

UniUS had a 'Plan B' that involved sponsoring local individuals to study optometry at a university in Brazil with which it has strong ties. This strategy indicates their willingness and intention to run the optometry training programme independently in future:

UniUS Management 4: ...we sent four students to Brazil to do their optometry studies there. But, er, at undergraduate level. So, the idea is they will come to UniUS and they will be the optometrists that will run the course the programme. And, um, of course, we want to have this and to keep, maintain this relationship with NEuroIT, we want that. But, as you can imagine, university needs to have its own autonomy also and not be forever dependent of this kind of relationship. (Key strategic actor at UniUS)

UniUS also planned to source its own technical support locally for maintaining the optometry teaching equipment. A key actor at UniUS described their tentative plans:

UniUS Management 2: And the next step for us, we can't wait for NEuro to do that for us, is to provide, to work with some companies, to find out companies in Mozambique in a way to ensure the maintenance of

equipment...franchising companies who are in Mozambique, probably with foreign capital.

The private teaching clinic that the university planned to build may also be built in collaboration with local business and is seen as a way for the university to raise funds (Interviews, UniUS Management 1, UniUS Management 1). Slaughter and Leslie (1997: 11) refer to partnerships that universities initiate with firms in order to make a profit as 'market behaviour'. They indicate that universities globally are under pressure to source funding to compensate for declining public funding, and engaging in 'market behaviour' is one of the strategies that are increasingly being employed (see also Gumpert, 2007). In Mozambique insufficient public funding, and resources generally, meant that the university had to find alternative sources of funding. Their participation in the MozOptom DNO is one strategy that they used, and collaborating with firms in public-private partnerships, is another.

These strategies also show that UniUS would be able to develop an optometry department at the university without the support of this particular project, but at a later stage. They utilised their existing 'South-South' partnerships to support their efforts to develop indigenous capacity. The MozOptom DNO was thus utilised specifically as a mechanism for accelerating the expansion of the university, and thus STI-capacity development. In an interview, one of the key actors at the level of management at UniUS stated:

UniUS Management 6: ...the optometry course, the optometry project is not, er, individual project in this faculty. This is, the Faculty is one...in this Faculty we have five courses, OK...if this programme runs alone, er, it is difficult to implement the programme.

During the first year or so of the project, the actors at UniUS who were involved in the DNO, formed a 'project team'. They met once a month to discuss and plan project activities. From the second year onwards, optometry lecturers and a new course co-ordinator (an optometrist with a Masters degree) were recruited, and the optometry department at the university was established. This shows how the optometry training programme was transformed from a 'development project' to a complete academic department at the university. Since the aim of the MozOptom DNO was to form a temporary organisation to develop a sustainable optometry training programme at UniUS, this result reflects a successful outcome for the DNO.

8.2.4 Personal 'development projects' of the actors

Although actors are motivated by their organisational affiliations for participating in a development project, they also have their personal motivations (Long, 2001). The two core actors at NEuroIT, who are involved in the day-to-day management of the project, reported that their main personal motivation for getting involved in the project and their continued involvement is the potential for having a positive impact on the lives of less privileged individuals. This was also an existential motivation as the feeling of making a positive difference gave them a sense of purpose and meaning. According to Fligstein and McAdam (2012), actors' existential need to develop meaning and a sense of belonging is important for developing shared meaning and commitment, which facilitates co-operation in strategic action fields. The actors found participation in the MozOptom DNO rewarding. They identified with the aim of developing indigenous capacity and thus making a lasting difference, a more noble achievement than the technical transfer focus of many other large scale aid projects in eye care. For example, one of the key actors described his personal motivation for participating in the MozOptom DNO:

DNO Executive Management 3: Um, so, I've been, you know, although I'm an optometrist by training, I've always had an interest in development, as such...So, I've been, for quite a long time, looking for a way to kind of get into making some kind of sustainable impact in terms of blindness and poverty...the DevAid fund basically kind of facilitated it.

Similarly, the optometry lecturers recruited for the training programme, all foreign, indicated that their main motivation was the potential to have a hand in the production of the first optometrists in Mozambique and have a long lasting impact. One lecturer reported that she was involved in the short-service development projects of a large eye care NGO and that it was not as rewarding as knowing that the programme will have sustained outcomes.

8.3 Resource-related power

Resource-related power included control of financial resources as well as knowledge resources. The lead institution (NEuroIT) controlled the DevAid budget for the DNO and held knowledge of the context of DevAid. Each of the core institutions held knowledge that was required in the DNO. The NGO and NEuroIT held expertise in optometry, and UniUS held knowledge of the context where the project was implemented. Since the analysis in the

previous chapter discusses power dynamics related to the control of resources in great detail, I only discuss this briefly in this chapter to minimise repetition.

8.3.1 Control of the financial resources

The biggest threat to the network was the conflict in the network that resulted due to struggles over the control of the financial resources. The control over the financial resources was not, however, in the control of the three core institutions, but was stipulated by DevAid. At the start of the project, the actors in Africa expected to have some say over how the budget was spent. They were disappointed when they found out that the lead institution would be controlling the funds. One of the key actors at OptomNGO told me about a conversation he had with one of the key actors at the lead institution to try to correct misunderstandings about the control of the financial resources:

DNO Executive Management 1: You know, the perception is, [the Principal Investigator] control(s) the purse, and you guys (at the lead institution) are benefitting. So I think we need to explain more to UniUS. [The Rector of the African university] needs to know where the money is going. And the fact is that these are some restrictions in the system. [The Principal Investigator doesn't] have a pool that you just allocate, you know, kind of thing.

In my discussions with the actors at UniUS I found that the conflict was not just about the perceived unequal access to the financial resources, it was also about the control of the agenda. Three of the five key actors at the level of management at UniUS complained about 'donors' imposing their ideas and agendas on their 'partners' in 'developing countries', despite the rhetoric of 'partnership' and 'collaboration'. One of these key actors explained:

what has to happen is that the donors have to be well-prepared for discussion. If people don't have the power to express their intentions and values (especially cultural values), it was not going to work. There should be more speech in the background and there shouldn't be an imposition of conditions...When I asked him for his views about development, I began saying that there was now talk of networks/collaboration/partnerships. He asked, 'What partnership?' There is no partnership the way things are with donors still imposing on developing countries (Fieldnotes, 23 May, 2011).

The actors at OptomNGO and NEuroIT did not recognise that their results-driven co-ordination or management strategy came across as ethnocentric, as them demanding that things be done their way. The fact that the MozOptom project was not initiated and designed by UniUS, and that the aid agency held NEuroIT accountable for the success of the project, was problematic.

8.3.2 Knowledge of the profession

In Chapter 5, I showed how OptomNGO controlled the definition of 'good knowledge' with regard to the optometry curriculum (Cowen, 2007). In section, I elaborate on how UniUS relied on OptomNGO and NEuroIT for the necessary optometry expertise for establishing the optometry department at the university. Besides the lack of funds, UniUS was also dependent on the actors and OptomNGO for their expertise in optometry and optometry training in order to develop the optometry department.

Not having local expertise in optometry presented a major challenge for the actors at UniUS who were involved in project activities during the first year of the project. The first local project team responsible for co-ordinating the course consisted of the Director of Academic Services, a course co-ordinator (who left the university during the first year or so of the project), the Deputy Director of the Faculty of Health Sciences and the first Network Manager. All, except the (Cuban) course co-ordinator, were locals, and none had expertise in optometry. Yet, they had to inform local communities of optometry, which was new to the country, in order to recruit students and they had to obtain an optometry curriculum to be implemented in the second year of the course (the first year was a general foundation year). This quote, by one actor who was part of the initial project team, describes the challenge of not having local optometry expertise:

UniUS Management 6: He (the second Network Manager) came one year after the beginning of the course because the first time the course was in our full responsibility. But it was very difficult for us, very difficult...But, er, what happened was, we had a team work on the optometry curriculum, but the team, no one of the team was optometrist. That was our main problem.

Obtaining a suitable curriculum, that is a curriculum that was up-to-date and internationally recognised, was described by two of the actors as particularly challenging. This quote, by one

actor who was part of the initial project team, describes the challenge of implementing an optometry curriculum by university management with no knowledge of optometry:

UniUS Management 6: We found that we can use the curriculum of Malawi because we know that in [other Northern Provinces] come optometry from Malawi to treat our, or Mozambicans travel to Malawi to have eye care treatment...we checked the curriculum, made some changes...to update for our country, for our situation, and for modern situation, new situation...When the optometrists came, they said, Oh, you made some mistake here.

The management at UniUS acknowledged their limitation of their lack of optometry knowledge in setting up the optometry training programme. The actor quoted above continued to say, 'And we say, [maybe it's normal] because all of us, we are not optometrists but we give to you, er, responsibility to change if you need to'. This response also indicates their trust in the actors at OptomNGO and the Training Co-ordinator, who was jointly recruited by OptomNGO and UniUS, to improve the curriculum.

Most of the key actors at OptomNGO and NEuroIT were qualified optometrists and were involved in teaching at universities. The actors at OptomNGO were most experienced in developing optometry capacity in Southern Africa. They did not, however, have experience in capacity development in Mozambique and neither did the actors at NEuroIT. They thus relied on the actors based in Tizangara for the necessary tacit knowledge.

8.3.3 'Knowledge of the context'

As Berger and Luckmann (1967) indicate, when actors enter a new field, they have to decide whether to learn the institutions governing behaviour in the context, which requires them to 'go out of themselves' and learn from others in the context. During the first year of the project in particular, the DNO was completely reliant on UniUS for knowledge of how things work in the local context and in accessing local networks (e.g. local government, ophthalmologists in the public system, etc.). They thus relied on the social capital of actors at UniUS. A key actor at OptomNGO stated:

I: What expectations did you have of UniUS?

DNO Executive Management 1: Well, the main expectation was that they would get the degree registered, the diploma and the degree. Get the system in place, etc.

Besides getting permission from UniUS to develop the training programme at the university and getting their assistance with recruiting lecturers, without knowledge of the education system in Mozambique they would not have been able to implement the project. Their dependency on UniUS for this knowledge indicated the knowledge power that UniUS held, which gave them greater leverage in asserting their autonomy and in the negotiation of institutions in the network. They mainly asserted their power through avoidance and resistance, as shown in the previous chapter.

The optometry lecturers and Training Co-ordinator was only recruited in the second year of the project. They then contributed in providing knowledge of the context. The first Network Manager was supposed to assist in providing an understanding of the context and facilitating access to local networks (including his relationships with actors at UniUS). He was not effective in this regard, but the second Network Manager was (as discussed in Chapter 7). The optometry training co-ordinator, in particular, played a key role in co-ordinating the training, including getting the revised curriculum approved and supporting the lecturers. She was reported to be a key contact person by all of the actors at the three core institutions (see Chapter 5).

Knowledge of the local context included proficiency in the local language. In the MozOptom DNO, language was another currency of power as the majority of people in Mozambique speak Portuguese and English is not commonly spoken, except among the elite (e.g. high level management in government, high level management at the university, etc.). None of the actors at OptomNGO and NEuroIT speak Portuguese.

8.4 Language and power

Language 'can be defined as a system of conceptual symbols that allows us to communicate' (Kim and Mattila, 2011: 2) and 'communication is a mechanism through which groups are created, maintained, and modified' (Scott, 1997 in Luring, 2011: 236). According to Bourdieu, individuals produce social organisation through their social relations and are themselves

produced in the process. Organisations are produced in social interaction through communication.

Research (e.g. Luring and Selmer, 2011) shows that utilising a common language in inter-organisational relations can be beneficial in making it easier for individuals to communicate and thus increase the willingness of individuals to communicate, thereby increasing the frequency of communication. Having a common language indicates a shared understanding in the form of common jargon and categories and frames of reference. However, some individuals may refuse to communicate in the common language if they are not comfortable speaking the language (in the case where the common language is their second or third language). Also, if the common language is a second or third language for some individuals, communication in the common language would be less rich and individuals may be self-conscious if they are not proficient in the language (Kim and Mattila, 2011; Luring, 2011).

The common language in the MozOptom DNO was English and all DNO members were expected to speak English as the actors at the lead institution and the NGO did not speak Portuguese and most did not speak Spanish. In recruiting optometry lecturers, the interviews were conducted by OptomNGO and were conducted mainly in English. However, since the person at OptomNGO who was responsible for conducting the interviews was fluent in Spanish, the interviews were also partly conducted in Spanish. One of the lecturers stated in an interview:

Optometry Lecturer 3: ...I did the interview in English, half English, half, er, Spanish (laughs). Yeah, but he's, he can speak very well Spanish because I remember that I was doing the interview with him, more or less like I'm talking with you, you know, and he asked me something, er, I go OK, I don't know the answer for this, I don't understand, OK, let's go talk Spanish.

All of the DNO members were thus proficient in English, except for one of the lecturers who was not as proficient. Both the lecturer and the other network members at OptomNGO indicated that her inability to speak English fluently hindered communication between them. One of her 'bosses' (at OptomNGO) did not speak Portuguese or Spanish. Since being able to communicate with him and others at OptomNGO and NEuroIT was essential, she planned to learn to speak English more fluently.

Not being able to speak Portuguese also hindered communication between the actors at OptomNGO and those at UniUS other than the Rector. Key actors at OptomNGO pointed out the importance of having a network manager who is bilingual (fluent in English and Portuguese):

DNO Core Management 4: So, because we don't speak Portuguese in this office (i.e. OptomNGO office), we need a liaison who can, er, speak both.

I: Yah. So, you can't just get a local person who speaks Portuguese.

DNO Executive Management 1: Yah, it won't work because he has to talk to, I mean, [the Principal Investigator] needs to report to DevAid. He needs to liaise with them, he needs, around the funding and all the resources. They have to liaise with us regularly on the peda, on the educational issues, about recruitment, about curriculum. All of that is run from here, you know, kind of thing.

I found that the individuals at high level management at UniUS, that is those involved in the decision-making on the project other than the optometry lecturers, were proficient in English and some of them studied and worked in English-speaking countries. Although they encouraged me to learn Portuguese, they readily conversed with me in English.

The Spanish-speaking optometry lecturers spoke Spanish amongst themselves and Portunol, that is, a mixture of Portuguese and Spanish, to the temporary lecturers from Portugal. They spoke mainly English to the Network Manager, who could speak Portuguese reasonably fluently as he conducted some business in Portuguese (e.g. arranging flights at the local airline offices), but his first language was English. I noticed that the students and other management staff at the university also spoke English to the Network Manager. The students sometimes struggled to speak English and tended to speak a mixture of English and Portuguese to the Network Manager and myself.

The Network Manager did not speak Portuguese when he first arrived in Tizangara, but later became proficient enough in the language to conduct business in Portuguese when required. For example, when he went to the bank for regular meetings, the consultants greeted him with a smile and they conversed only in Portuguese. He did, however, indicate that he sometimes felt left out of conversations with his Portuguese-speaking friends as they spoke

too fast for him to follow the conversation. Also, he felt self-conscious speaking Portuguese as he did not feel that he spoke it as eloquently as he spoke English. Luring and Selmer (2011) too found that having a common language (English) for the formal management of the organisation was beneficial for organisational performance, whereas the common language for informal or social interaction had a negative impact as communication was not as rich and not everyone was comfortable speaking the common language.

The majority of the optometry lecturers spoke Spanish rather than Portuguese and they conversed with the students and the local lecturers in Portunol. In participating in the training sessions as a participant observer, I found that the language differences did not hinder conversation between the lecturers and the students. When the students did not understand the lecturer, they would ask for clarity either from the lecturer or from fellow students or both. The lectures I observed were always interactive, with lots of participation from the students. The students reported in the focus groups that the spoken language of the lecturers was not problematic as many of the lecturers at UniUS, besides the optometry lecturers, spoke Spanish and Portunol, so they were used to it. The students discussed the language differences in the focus group discussions:

P1: Yes, I think we can easily interact with people who speak other languages. So, we think now it's normal for us.

P3: ...(in the beginning) we spoke Portuguese and the tutors spoke Spanish and the material was written in English. So, in principle, it was a bit complicated. So, it wasn't easy for us to read English because the material, the books were written in English. But some teachers normally used to translate the material they used to give to us. So, I think in some way that helped us to understand.

As indicated in the quote above, some students found reading in English particularly difficult as most of them were only taught basic-level English at school. One of the students reported that the problems they had with most of the books available to them being in English or Spanish or incorrectly translated, occurred mainly during the first two and half years of the course as they received more books, some in Portuguese, during the third year. Two other students elaborated further on the difficulty they experienced in reading English and how they dealt with this challenge:

P4: So, there are a lot of books in English and Spanish, so that's not very easy...sometimes it's difficult for us to tell the name of the book because sometimes the name is written in English or Spanish. Also, there are books that have been translated but they were wrongly translated.

P2: We get information from the internet, we get information from other books and then we compare so that we see the difference.

The actors at high level management at UniUS were also not happy with the lectures, class notes and textbooks being delivered in English rather than Portuguese. Two key decision makers at UniUS complained about the challenge presented by course materials provided in English:

UniUS Management 4: they (the two actors at the lead institution) offer one or two books of optometry in English and we didn't have at all any book of optometry. I think we started receiving books of optometry in 2010, I think...They, I think, most of them are in English...students don't receive English to study at a university level...People use English at secondary school to say, er, My name is this, How are you and this and that...and you come and say, Well, you have this books in English, you can study. You are telling people, er, 'Don't study, go home'.

According to these actors, they discussed the difficulty students had with reading English with the actors at the lead institution and requested that they obtain textbooks in Portuguese:

UniUS Management 2: ...we discussed with, in the presence with [The Principal Investigator] last year...a way to, for them to make efforts, like, to buy, to purchase Portuguese textbooks...But there was some problems presented by [The Principal Investigator] and the NEuroIT team...They could get books from Portugal or from Brazil, but they, it's still, difficult for us to (smiles), to have NEuroIT understand the needs from UniUS. But, in the future, next future probably we'll have that then, I'm assuming.

There were, however, plans in place for the optometry lecturers to take Portuguese lessons from the Portuguese lecturer at the university. Towards the end of 2011, the training co-ordinator requested that a Portuguese lecturer at the African university give her and the

optometry lecturers Portuguese lessons. Besides teaching, the training co-ordinator had lots of administrative work and she found that using Google translate for completing official documents was limiting as the translations were not always grammatically correct (Fieldnotes, 29 July 2011).

Three key actors at the three core organisations complained that they had difficulty translating official documents to be submitted to government. For example, their application for conducting a large scale research study assessing eye care in the country was declined a few times as they were not properly completed. Also, the students complained, in the focus groups, that their course hand outs were incorrectly translated at times, which meant that they had to look up many of the meanings in a dictionary in order to understand the documents.

While most of the actors in eye care in Mozambique were open to speaking English as a common language for managing the project, some individuals refused to communicate in a language other than Portuguese. This is a form of language-based power as some are excluded from the conversation or meeting (see Luring and Selmer, 2011). One of the key actors based in Africa told me that he had been in meetings with the National Eye-care Co-ordinator and the Head of Ophthalmology at the local hospital. These individuals were proficient in English, as he had heard them speaking English in other settings, but did not want to conduct meetings in English although most attendees of the meetings were affiliated with international NGOs and thus were fluent in English. The non-Portuguese speaking individuals attending the meetings thus had to get someone to translate for them during the meetings. One of the key actors in Ophthalmology in the northern region of Mozambique requested that I bring an English-Portuguese translator with when I interviewed him. He stated that since we are in Mozambique, we should speak Portuguese. One of the key actors at NEuroIT stated in an interview:

DNO Core Management 1: Yeah, or communicate with the government, they would prefer that it is in Portuguese even though a lot of the government officials can speak English.

It is commonly thought that cultural filters or cultural frames help individuals encode and decode messages closely to the way they were intended. Language is a way in which to understanding culture. Individuals speaking both languages, English and Portuguese, thus held

greater power in that they were able to meaningfully access both groups. The lack of knowledge of either language meant exclusion from the group and dependency on mediators. The discussion on power dynamics related to the control of resources and knowledge, and language differences indicates inequalities as well as interdependency among the actors in the network.

8.5 Developing relationships based on trust(worthiness)

Trust emerged as an important element for facilitating co-operation among the members of the MozOptom DNO. As discussed in the previous chapter, the core actors at OptomNGO and NEuroIT referred to the relationship between them as being characterised by 'complete trust'. They reported high frequencies of interaction among themselves (from daily to weekly) and friendship or informal ties (see also the structural network analysis in Chapter 6). They trusted each other's decisions even when they did not completely agree with it and, as the largest group involved in the team managing the day-to-day activities of the project, they consulted each other in decision-making and copied each other in on e-mails (where appropriate) as a way of keeping each other informed (see Chapter 9). For example, OptomNGO respected the actors at NEuroIT's decision to recruit a non-local person for the position of Network Manager when the first Network Manager resigned, even though this went against their policy to recruit locals as a means of empowering locals and gaining from their tacit knowledge of the context. One key actor at OptomNGO reports on their perception of this decision:

DNO Executive Management 1: So, you know, with (the Network Co-ordinator) and (Principal Investigator) you feel you have people in Africa. But it can be a problem in a lot of settings because people are so remote, they, they think they need to determine everything. But with them, there's a very good democratic culture in the way we deal with things. So, so we actually don't worry about it half the time (laughs)...we are consulted at every step of the way, etc.

Uzzi (1996) had a similar finding in his ethnographic research on business relations, where actors who trusted each other were more likely to interpret each other's actions and intentions favourably. He points out that trust is essential for developing strong ties, which facilitates the exchange of fine grained information and joint decision-making. Through shared meaning, actors are able to interpret information and imbue value to the information with which others can identify. Uzzi (1996), among others (e.g. Coleman, 1988), concluded that

trust was also a governing mechanism that reduced transaction costs and time for making decisions. I found this to be true for the relations among the core actors at OptomNGO and NEuroIT. Repeated interaction and shared meaning assisted in the building of trust amongst these actors. Coleman (1988) indicates that a closed social structure, that is, a social structure characterised by strong ties among actors, is necessary for the negotiation of norms for interaction and collective sanctioning.

Also, obligations or credit slips for favours are more likely to occur in strong ties based on trust, which facilitates co-operation (Coleman, 1988). This strategy of creating credit slips or a condition for reciprocity was part of the social strategy of the core actors at NEuroIT for developing stronger ties between themselves and core actors at OptomNGO and UniUS. For example, the Principal Investigator asked the Director at OptomNGO to co-supervise the PhD research funded as part of the project.

Due to the unequal power relations, the relations between core actors at NEuroIT and UniUS were not, however, based on complete trust. Complete trust was not necessary for co-operation as it is often claimed in the literature (see Coleman, 1988; Serra, 2011; Tomlinson, 2005). Four of the five core actors at UniUS perceived 'donors' (in general) as typically serving their own interests rather than paying attention to the needs of the local context. Unlike the NEuroIT-OptomNGO relations, joint decision-making and trusting each other's decisions were not features of the UniUS-NEuroIT (and OptomNGO) relations. The core actors at NEuroIT and OptomNGO complained about the actors at UniUS not understanding their point of view or taking their advice with regard to the way that the university structured the training programmes. They found it difficult to get management at UniUS to actively engage in the network organisation. On the other hand, the core actors at UniUS complained about some of the decisions of NEuroIT and OptomNGO that had a significant impact on the training programme. For example, they complained that during the first three years of the project, the only textbooks and some of the teaching materials that the other organisations provided were in English. They were perceived by UniUS as focussing on their own interest in piloting an optometry training model rather than ensuring that the needs of the optometry students, and thus UniUS, were met. The following statements by two key decision-makers at UniUS show this perception:

UniUS Management 2: ...it's still, er, difficult for us to (smiles), to have NEuroIT understand the needs from UniUS.

UniUS Management 4: ...the recent things that they publish in every science are published in English. But, these are, there's a different context in Mozambique and I, I think we also believe, we all believe that things need to be contextualised and not be copied, like, well, you have to, to implement like that.

The core actors at NEuroIT had to put a lot of effort into building trust with the actors based in Africa, partly because of the pre-existing norms associated with the unequal relations created by the funding model. The success of these actors in facilitating co-operation, that is, the extent to which their social strategies were effective, depended on the symbolic power that they held in the DNO (Hallett, 2003) and the extent to which they were 'trusted'. In Chapters 5 and 7, I show that complete trust was not necessary for achieving co-operation as it is commonly reported in the mainstream social capital literature (see Serra, 2011). The perception of 'trustworthiness' was the most important factor influencing the decision to co-operate (cf Tomlinson, 2005; Ynalveza and Shrumb, 2011).

The degree of trust established is related to the distinction between 'thick' and 'thin' ('arms-length) exchange described by Uzzi (1996). In the MozOptom DNO, relationships characterised by 'complete trust' were also characterised by 'thick' co-operation, whereas 'thin' co-operation followed the perception of trustworthiness. An example of the former is the relationship between the actors at NEuroIT and OptomNGO, and the relationship between Training Co-ordinator and management at UniUS. An example of the latter is the relationship between management at UniUS and the actors at NEuroIT and the Network Manager.

The new Network Manager worked to facilitate the delivery of project objectives. His ability to identify and understand each institution's needs in the DNO, and ensure that the needs were fulfilled, facilitated trust and co-operation among project members at UniUS and the other organisations. This was explained in an interview with a project member at the level of management at UniUS:

UniUS Management 6: And when (the Network Manager) came they, er, they said to us that you will have all the equipment you need. That was doubt for us in that time... Now, I can say to you that the optometry course is the best course, well-equipped in the Faculty...

The other actor reported to be a key contact for the project by all of the core actors at the three core organisations is the training co-ordinator. She was described as having similar importance as a bridge between actors at UniUS and actors at the other organisations. The Network Manager was responsible for co-ordinating general project activities on the ground in Tizangara and she was responsible specifically for co-ordinating the training programme. Like the other optometry lecturers, she was jointly employed by OptomNGO and UniUS. After the first year of co-ordinating the course, the training co-ordinator was successful in getting the curriculum approved and those at high level management began to trust her to make decisions related to the training programme. It was reported that they respected her decisions. In the field, I observed close ties, akin to friendship ties, between the actors at UniUS and the training co-ordinator. For example, on her birthday, the Rector, after attending a meeting, sent a message for her to wait for him as she was about to leave the university. He greeted her with a hug and wished her a happy birthday. Core actors at UniUS also praised her for her hard work in co-ordinating the training programme. They were especially proud when the training programme gained national attention and a reputation as the best course at the university, amongst the students at UniUS.

Further supporting the development of strong ties and trust, were the informal relations or 'friendship ties' amongst the actors. The structural social network analysis in Chapter 6 showed how significant 'friendship' ties were in the DNO. In the field, I observed these 'friendship' ties 'live'. The team based in Tizangara, including the Network Manager, Training Co-ordinator and lecturers frequently went on weekend getaways to the coast together. They also often had lunch together at the training co-ordinator's apartment, which she shared with another optometry lecturer. On one occasion, together with the optometry students, they celebrated the birthdays of two of the lecturers by having cake and refreshments. They also had farewell parties, at university or outside of the university, when lecturers left. At these parties, someone always brought along a guitar and all would sing and some would dance and read poetry. When the actors at OptomNGO and NEuroIT visited Tizangara, they met with the lecturers, Network Manager and training co-ordinator at a coffee shop to discuss project activities. The friendship ties amongst these actors facilitated the development of strong ties based on trust, which facilitated their formal working relationships (cf. Holohan, 2005; Uzzi, 1996). For example, one key actor based in Tizangara described her relationship with another key actor who she refers to as her 'big support': ...we have very, very good relationship in terms of [labour] and also in friendship. (Optometry Lecturer 6)

The presence of both friendship and formal ties amongst these actors was, however, reported, by two of the actors in the group based in Tizangara, to cause confusion with regard to the role of the actors. For example, two of the optometry lecturers indicated that when they met with the Network Manager outside of work, they were unsure of whether they should talk to him about certain things related to the project as, in addition to him being a friend, he was the Network Manager of the project. Hence, friendship ties did not always facilitate co-operation and decision-making.

8.6 Conclusion

This chapter (and the previous chapter) addressed the question, What can we learn about power and how it is handled by all participants in a development network organisation (DNO) through an analysis of the power relations and the strategies of actors in the MozOptom DNO? The discussion on power shows that power is multi-dimensional. In the MozOptom DNO, co-operation was crucial for effective collective action towards achieving the common development goals, but was hindered by power related to the control of resources (financial and knowledge) and language differences. The most significant finding was that the high level of inter-dependency among actors in the DNO acted as another currency of power in the DNO and that this currency of power actually weakened the power of the traditional dominant actors in 'North-South' development networks.

Another significant finding was that the social skill of strategic actors, especially those effectively acting as bridges between the actors at OptomNGO and NEuroIT, was crucial in the development of trust. The inequalities were not, however, completely overcome. The assertion of human agency, the social skill of strategic actors and the assertion of power related to the interdependency among the actors in the network organisation, facilitated the subversion of power to an extent.

In the next chapter, the use of ICTs in facilitating communication, and the modes of communication utilised in the MozOptom DNO are identified and discussed.

Chapter 9 Modes of communication and strategies for co-ordinated action in development network organisations

Development network organisations (DNOs), which have emerged in the field of development in recent years, are toolled by ICTs (see Borgatti, 2001; Holohan, 2005). Computer-mediated communication enables the frequent transnational inter-organisational communication that is a significant characteristic of DNOs, allowing for the emergence of high levels of interdependence and interconnectivity (see Castells, 1999; Sassen, 2002a).

DNOs, as organic structures, typically emerge in rapidly changing environments characterised by high levels of uncertainty and risk (Burns and Stalker, 1961; Watts, 2003). Hence, 'co-ordinated action' in DNOs is 'rarely routine' as it requires individuals to act under conditions of high levels of ambiguity (Nohria and Eccles, 1992: 288). How to effectively co-ordinate action for achieving the common goals of the network is a major challenge. Research on network organisations show that due to the conditions of high levels of ambiguity and greater dependence on specialised knowledge and social mechanisms for co-ordination and control, *the individual* plays a more central role in the organisation (Jones et al., 1997; Nohria and Eccles, 1992). Under conditions of high ambiguity, individuals need to be in tune with each other and the needs of the network. Effective modes of communication are crucial for this, especially in transnational inter-organisational networks, such as the MozOptom DNO, where frequent face-to-face communication among all network members is generally not possible. As emphasised in the literature, access to the internet is essential in inter-organisational situations (e.g. Holohan, 2005) and certain modes of communication are better suited to certain contexts (e.g. Nohria and Eccles, 1992).

In the case of the MozOptom DNO, the instrumentality of the accessibility of ICTs, and the appropriateness and culture of using ICTs, as well as the necessity of regular face-to-face communication, emerged as essential for understanding how activities are co-ordinated in the project. These themes are discussed in detail in this chapter. The analysis draws on quantitative data obtained via the survey, and qualitative data obtained via the interviews and ethnographic research. Since the survey provided more systematic data of the modes of communication utilised by the project members for each of their interactions, the structural network analysis discussed in this chapter draws on the survey data. The qualitative data confirmed the results of the survey, and provides more detailed information of how and why

certain modes of communication were selected and the implications of these modes for the project activities.

9.1 Computer-mediated versus old-fashion face-to-face and telephonic communication

Much research exists on the central role that ICTs plays in network organisations (McKenney et al., 1992; Nohria and Eccles, 1992; Nohria and Berkley 1994; Symon, 2000). Some authors have argued that in network organisations, computer-mediated communication, that is the more 'modern' modes of communication, render other modes, such as face-to-face meetings, obsolete. Others argue that face-to-face communication is even more essential for network organisations due to the emphasis on the social dimension in such organisations (Jones et al., 1997; Nohria and Eccles, 1992). An important question raised is, which modes of communication are most appropriate when? There is a lack of 'real life' empirical research in this area as much of the research that exists is based on laboratory experiments (Symon, 2000).

In the MozOptom DNO, the modes of communication utilised most were computer-mediated communication, specifically e-mails (79% of interactions reported), followed by face-to-face meetings (62% of interactions) (see Table 3 below). It can be seen in Table 3 that other forms of direct communication (i.e. telephonic, and internet calls and chats) and remote communication (i.e. text messaging) were also utilised, but to a considerably lesser extent. Social networking tools were utilised among 10 of the DNO members. Except for the interaction between two of the optometry lecturers at UniUS, all of the interactions via social networking tools were transnational and included interactions with project members holding a range of positions in the network (Principle Investigator, PhD student, lecturers and Network Manager). It is important to note that the results simply show the modes of communication that project members selected in interacting with other project members, and not the frequency with which they utilised the different modes of communication. This information was obtained via the interviews and ethnographic research.

Mode of communication	Number of interactions	% total interaction² in network
E-mails	170	79.07
Face-to-face meetings	134	62.33
Phone calls	54	25.12
Internet calls, chat (e.g. Skype)	50	23.26
Text messaging	17	7.91
Social networking (e.g. Facebook, Twitter)	12	5.58

Table 3 Modes of communication utilised by project members

Notes:

1. The table is based on the survey data, specifically responses to the question: 'Please indicate the three modes of communication you use most often in communicating with each of the project members with whom you interact (April 2010 March 2012)'.
2. The proportion of the total number of interactions reported in response to the specific question from which the data was obtained.

Table 3 indicates that although e-mails were reportedly utilised most by members of the MozOptom DNO for communication on project activities, face-to-face communication was utilised almost as much. Thus, in agreement with Nohria and Eccles (1992), the data shows that although much communication in the DNO tended to be computer-mediated, the 'physical structure' of the organisation has not completely disappeared. In the case of the MozOptom DNO, the physical structure is not a physical building, but a series of face-to-face meetings between the project members that took place in different spaces. Parallel with this structure is the virtual structure consisting of a group of individuals sitting at their laptops or computers and communicating via the Internet. While much attention has been given to the virtual structure of such networks and virtual networks, face-to-face (and telephonic communication) has been shown to be just as crucial for the co-ordination of project activities (McKenney et al., 1992; Nohria and Eccles, 1992). Nohria and Eccles (1992) go as far as arguing that computer-mediated communication is actually more appropriate for bureaucratic organisational structures as it is less personal and more distant than face-to-face communication. McKenney et al.'s (1992) research shows that e-mail and face-to-face communication can actually be complementary modes of communication for achieving co-ordinated action.

9.1.1 Computer-mediated communication

The data obtained via the survey revealed that 63.8% of the 240 interactions reported among the MozOptom DNO members were across national borders, whereas 18.8% were within Mozambique, 14.6% within the other Southern African country and 2.9% within NEuro. A total of 64.1% of the e-mail communication (i.e. 109 of 170) among network members were transnational. The interview data confirms this finding. Communication via e-mail was described as the best, most efficient mode of communication, particularly for communication across borders and time zones, in order to achieve project goals. One of the project members based at OptomNGO stated: 'E-mail...it's the quickest, quickest response. There's a six hour difference, time difference, but it hasn't really been a problem' (Interview, OptomNGO Staff 2).

Figure 17 below illustrates the density of the e-mail sub-network. The geometric shapes point out the different groupings per country. The structural network analysis of the survey data shows that, on average, the project members communicated with 11 other members via e-mail. The Network Co-ordinator, Network Manager and Principle Investigator were involved in most of the e-mail communication in the network (Degree centrality = 27, 23 and 21, normalised degree centrality = 0.93, 0.79 and 0.21 respectively).

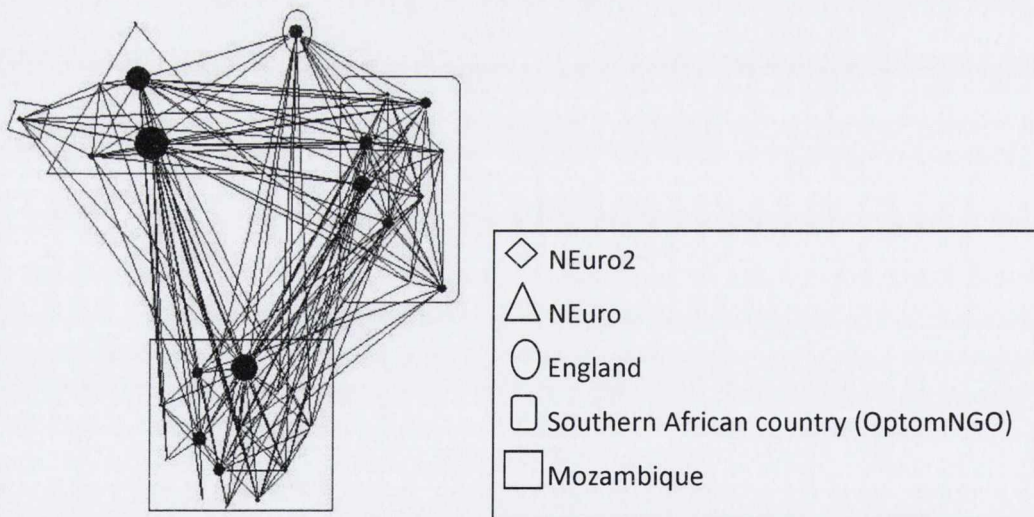


Figure 17 E-mail network

E-mail communication facilitated direct communication, participation and open discussion among a wider range of people and across organisational and geographical barriers, making it possible for the network to be more egalitarian. The structural network analysis shows how

well-connected the network is and that, on average, project members communicated with 16 other project members, that is slightly more than half of the network. E-mail communication was efficient as a tool for preparing documents that required input from other project members. For example, in developing research tools (e.g. eye care assessment tools), the documents would be sent via e-mail to relevant project members at NEuroIT and OptomNGO, so that each could comment and contribute to the tools without the hassle of arranging face-to-face or telephonic meetings (personal communication with the Network Co-ordinator). One of the project members responsible for the co-ordination of project activities explained:

DNO Core Management 1: (Director of OptomNGO), especially, is traveling a lot. Most of the time he's very hard to pin down...So, if you were to try and get everyone involved in the tool, in the same place at one time, it would, it would take a few weeks. Yeah, so e-mails tend to be, tend to be easier.

E-mail communication was also beneficial as a mechanism for keeping project members informed of issues and discussions relevant to them. A project manager responsible for managing the research side of the project explained that simply copying people in on e-mails relevant to them, 'making sure that everyone is on the same page', saved the time of communicating back and forth to keep people informed. Keeping all of the key project members informed about discussions on project activities and work done also facilitates communication and the building of relationships as all are made to feel included in the goings on in the project.

Interestingly, as indicated in the quote below, the ease of e-mail communication also made it possible for those in authority to oversee project activities and thus exert control, even remotely (see also Symon, 2000). One of the project members responsible for the co-ordination of project activities explained:

DNO Core Management 1: Um, because, I suppose in terms of research, it, it's really, (the Principal Investigator) and (the Director of OptomNGO) are the leads...Um, he likes to be kept in the loop on the e-mails, and he, if it's very important, he'll reply as quickly as he can...So at least if they are seeing the e-mails, they are seeing the conversation.

Another important finding is that project members were selectively copied in on e-mails, depending on their role in the network and the subject matter, as indicated by a member of the core management team:

DNO Core Management 1: So, depends on the topic we're, we're discussing. If we're discussing a research topic, we will, we will e-mail between (NEuroIT) and (OptomNGO), we'll include the (OptomNGO Research Centre), and if we're, um, and we may include (NEuroUni) staff in that as well and (NEuroIT) staff in that as well.

This is understandable as not all information is relevant or useful for all project members. Symon (2000) points out that while e-mail communication may be useful for the dissemination of information, too much information being sent may result in the recipients experiencing information overload, which may lead to them overlooking or ignoring important information. The project member quoted above referred to the core group responsible for the day-to-day management of the project and the research activities, as 'the inner circle'. Project members based at the three institutions, NEuroIT, UniUS and OptomNGO, reported that the 'the inner circle' included the members affiliated with NEuroIT and OptomNGO who, together, are referred to as the implementers of the project. Individuals involved in this core group were responsible for the co-ordination of project activities and thus facilitated information sharing. In so doing, they also controlled the sharing of information. One example is a discussion that I had with two project members, at the level of management at UniUS, who complained that NEuroIT had not done a needs assessment at the start of the project to get a sense of the language usage before recruiting lecturers and providing course materials in English, a language in which the students were not proficient (Fieldnotes, 26 May 2011). A needs assessment had in fact been done with the students, as part of the PhD research funded by the project. Individuals involved in the research side of the project were affiliated with NEuroIT and/or OptomNGO, and hence, these organisations were kept in the loop with regard to the research activities. Another reason for the two university managers not being aware of the research may be that the information was distributed, but may have been overlooked. This is indicated by an example from my experience of the distribution of information about my research on the network. While in the field, a key project member involved in the daily running of the optometry training programme at UniUS complained that she was not informed about my research and requested a meeting with me. I explained to her the procedure that I followed in obtaining permission to do the research and reminded her that she was copied in on my e-mail communication with the key project members. The e-

mails provided a brief description of the research. As indicated in the excerpt from my fieldnotes, she did not recall receiving the e-mails, even though she had actually responded to one of the e-mails (Fieldnotes, 2 November 2011):

She...said that she may have received that e-mail but that it was long ago and she's been so busy she doesn't remember. She said that she's also been so busy that she didn't have time to ask me about the research. I told her that (DNO Executive Management 3) advised me to send documents to him and that he would send it on to relevant people. She replied that she didn't get anything.

As the above discussion shows, while e-mail communication facilitated communication in the network, there were also some disadvantages to relying on e-mail communication. Reliance mainly on e-mail communication between the project members at NEuroIT and OptomNGO and the project members at UniUS was particularly problematic during the initial stage of the project, before stronger ties among project members were formed. During the first year or so of the project, members at NEuroIT and OptomNGO communicated with and sent documents to project members at UniUS mainly via e-mail. The project members later realised that this strategy was unsuitable as project members at the university failed to communicate challenges they faced. The project members based outside of Mozambique claimed to only have found out about these challenges and issues when they travelled to Mozambique and met with the management at the university face-to-face. The problem with relying mainly on e-mails, in the beginning, was reported by a core project member at NEuroIT:

DNO Core Management 1: ...when we went over we found out a lot more about the issues they were having and the problems they were having, when we were face-to-face with them. So, in e-mails they don't really tell you what the problems are.

More personal forms of communication, especially face-to-face communication, were found to be appropriate during the initial stage of setting up the project and in certain types of situations. E-mail communication was not effective in motivating project members to participate and engage in project activities, and communicate problems and challenges experienced, especially not before relationships had been properly established and network norms were negotiated. McKenney et al (1992: 285) reported similar findings and concluded

that face-to-face communication effectively serves as a 'context-creating medium', whereas e-mail communication effectively serves as a 'context-reliant medium'. It is thus not surprising that e-mail communication worked better for communication between project members at NEuroIT and OptomNGO as interaction between them was also through regular (face-to-face) meetings and workshops in NEuro and the city where OptomNGO is based, which provided opportunities to 'create the context' and effective strategies for interaction between them. According to a core project member, the Rector of UniUS was invited to these meetings and workshops but opted to not attend for whatever reason. Communication between project members at NEuroIT and OptomNGO and project members at UniUS was mostly mediated via the Network Manager and the optometry training co-ordinator. This communication strategy was described by a core project member based in NEuro:

DNO Executive Management 3: Um, I mean e-mail contact is...the most dominant, um, and that...would typically be with, um, kind of depends on the context, but usually it's with (OptomNGO) and (the Network Manager). And depending on, on who's involved, it could be faculty issues, then [Training Co-ordinator] is involved. If there are specific issues about pedagogy or research then, er, some of the (UniUS) staff might be involved. But generally (the Network Manager) looks after the (UniUS) angle if you like. Most e-mail goes through him and gets direction then as appropriate, um, because we don't know, we don't always know who's the most appropriate person to, to take queries or deal with issues.

The project members at the African university did not feel that they could easily communicate challenges that they were experiencing with the project members at the other institutions due to the perceived inequality along the lines of the legacy of donor-recipient relationships. This perception was communicated by a key actor at UniUS: 'Otherwise, it, it's very hard to discuss that because, er, they are donors of the, the project, you know'. Thus, although direct communication via e-mail was possible, it was not exercised due to the perceived power imbalance. Hence, as Symon (2000) highlights, the organisational culture and culture of the wider social context may become salient in e-mails. This finding is counter to other research that argues that social cues are not really communicated in e-mails. Here, social cues are communicated by non-communication. By not communicating the problems and challenges they experienced, such as obtaining a suitable curriculum, recruiting students, obtaining premises, etc., to the rest of the network, the project members at UniUS treated these

problems and challenges as their (organisational) problems and challenges rather than that of the network, even though they would potentially hinder the achievement of network goals.

It is essential to point out that the project members also made use of other modes of computer mediated communication, that is, internet calls and chats.

Internet calls/chats were utilised by 21 of the project members (23.26% of interactions according to the survey data). The sub-network utilising Internet calls and/or chats are illustrated in Figure 18. The network is not as dense as that of the e-mail communication network, but what is apparent is that a considerable proportion of this communication was inter-organisational and cross-border. In fact, 72.0% (36) of the interactions were cross-border. On average, project members communicated with three other members via Internet calls/chats. Some of the project members based in the Southern African city where OptomNGO is based and Tizangara also reported utilising Internet calls/chats for communicating with project members based locally (9 and 5 of the Internet interactions respectively). The structural network analysis of the Internet call/chat network revealed that this mode of communication was utilised by a particular group of individuals for communicating project activities: the optometry lecturers and Network Manager based in Tizangara, all of the project members based at OptomNGO, and the Principle Investigator and Network Co-ordinator based NEuro. This group of individuals also make up the group involved in the daily management of the project. Furthermore, as illustrated in Figure 18, a different set of individuals are central in this network: the HR manager and curriculum specialist at OptomNGO (Degree centrality = 15, normalised Degree centrality = 0.52), the Principle Investigator (10, 0.35) and the training co-ordinator (10, 0.35).

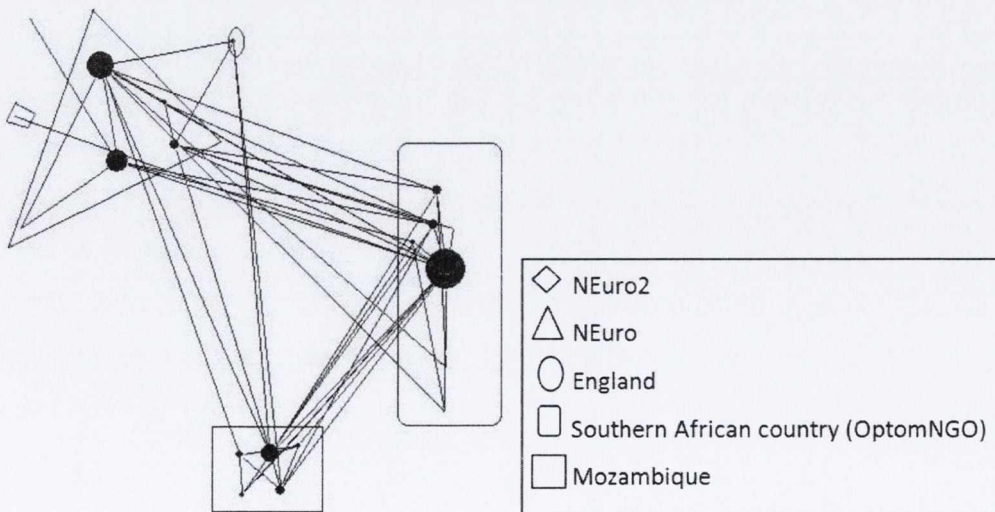


Figure 18 Internet call/chat network

Skype, in particular, was utilised – mainly computer-to-computer (audio) calls. A project member, based in NEuro, involved in the co-ordination of the project pointed this out:

DNO Core Management 1: Yeah, a lot of Skype calls to (OptomNGO in Southern Africa). Sometimes we have teleconferences, just for, if it's a bit more official. And also, with (the Network Manager) in, with (the Network Manager) in Tizangara, the phone is usually better than the internet and if we do Skype, the line can be a bit broken up.

As indicated in this quote, Skype was used for communication with a certain group of project members. The project member quoted above indicated that Skype with the Network Manager in Tizangara is often problematic due to the problems with internet connectivity in Tizangara. The internet connectivity in Mozambique did, however, improve later in the year in which the interview was conducted due to the undersea cable being laid off the coast of Africa. According to a core project member based in Tizangara, during the first two years after he arrived in Tizangara, 'they wouldn't have internet most times, whereas now they have internet more often than not' (fieldnotes, 24 November 2011). The period in which I conducted the fieldwork in Mozambique was after the improvements to internet connectivity. I observed that, the Network Manager and training co-ordinator, both based in Tizangara, utilised Skype often and also held formal teleconference meetings via Skype (fieldnotes 25 May, 27 July, 29 July, 4 August and 21 November 2011). The Network Manager and Network Co-ordinator, who were jointly responsible for the co-ordination of project activities, communicated via Skype on a daily basis, as indicated by a key project member:

DNO Executive Management 3: Skype conferences between (the Network Co-ordinator) and (the Network Manager), almost daily I would say. Um, with me less often but I would only get involved when it's, it gets to a level that kind of, you know, decisions have to be made or, funding has to be applied or something like that.

The quote above indicates that Skype was useful for project members who had to be in contact on a daily basis but were based in different countries and organisations. When communication was not that frequent, such as with the high level decision-makers who were only consulted with regard to specific types of decisions, Skype was used less often. Also, unlike e-mail communication, calls and chats via Skype (and other internet call/chat programmes) are direct and more personal modes of communication, and feedback is

received immediately, similar to telephonic and face-to-face communication. Skype was also seen as a less formal mode of communication than teleconferences, implying that Skype also works for more robust relationships.

Besides formal communication about project activities, project members also used Skype for keeping contact with their families and friends in their home countries and for informal communication with other project members (fieldnotes, 29 July 2011). As Ibarra (1992) points out, in organisations, informal and formal relations among staff co-exist and tend to reinforce each other.

Computer-mediated communication was thus instrumental in facilitating (formal and informal) communication among project members. This type of communication did, however, have its limitations and were found to be unsuitable for certain types of situations. This finding is in agreement with that of McKenney et al (1992) and Nohria and Eccles (1992). More direct and personal means of communication, specifically face-to-face and telephonic communication, were identified as appropriate modes of communication for overcoming some of these limitations.

9.1.2 Face-to-face and telephonic communication

Regular and relatively frequent face-to-face meetings were, however, found to be necessary for the effective co-ordination of project activities. Hence the finding of the survey that, in the MozOptom DNO, face-to-face meetings were utilised almost as much as e-mails. The density of the face-to-face communication network is depicted in Figure 19 below. It can be seen in Figure 19 that much of the face-to-face communication was across national borders. On average, project members communicated with nine other members via face-to-face meetings, specifically with regard to project-related activities.

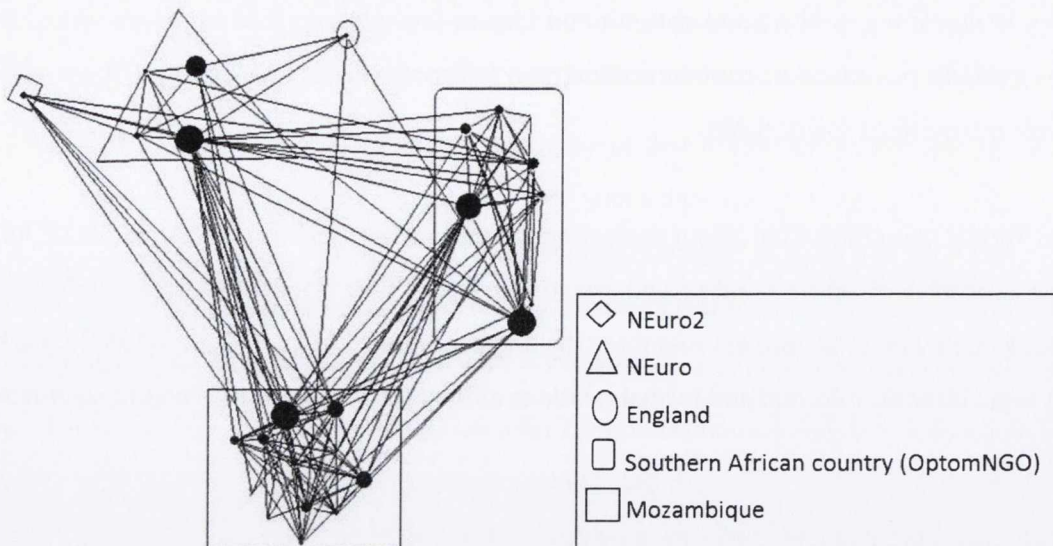


Figure 19 Face-to-face communication network

Specifically, face-to-face communication was preferred over e-mails when establishing relationships, solving problems, dealing with conflict, disseminating important information, and distributing work and higher-level decision-making, particularly that which depended on lively discussion. A key project member at NEuroIT pointed out the value of open communication in the network, which was described as being particularly important for dealing with conflict in the network:

DNO Executive Management 3: Um, if there is a problem, we're just open with it and we open a line of communication and it ends up being solved in person, um, or at the very least telephonically rather than via e-mail and etc.

As indicated in the quote above, more direct and personal modes of communication, specifically face-to-face and telephonic communication were preferred in dealing with conflict, rather than e-mail communication. The former was reported to be more in-line with their open communication policy.

Other than the potential for misunderstandings to arise and the tendency to overlook e-mails, the project members responsible for the co-ordination of project activities complained about the difficulty of getting project members, particularly those at the level of management at UniUS, to actively engage in discussions and project activities and flag problems and challenges via e-mail. In a face-to-face meeting involving the core project members at

NEuroIT, OptomNGO and UniUS, it was agreed that NEuroIT and OptomNGO would communicate their motives and reasons for taking certain decisions more openly and that UniUS would flag problems when they arose in order to improve their relationships for better co-operation in the network (Interview, DNO Executive Management 3). It is apparent that the 'flagging' of challenges and problems when they arise was a norm that project members at NEuroIT and OptomNGO thought important and wanted to develop in the network as the sooner these issues were flagged in the network, the sooner they could be addressed (see Chapter 7). Since communication between the project members at NEuroIT and OptomNGO and project members at UniUS occurred mainly via e-mail during the initial stage of the research, effective negotiation of such network norms was difficult. Reliance on e-mail communication also increased the likelihood for communication to be misunderstood or misinterpreted or ignored. A core project member explained:

DNO Executive Management 3: ...when it was mostly telecommunications there was certainly much more scope for, um, for there to be misunderstanding and miscommunication, and I think that's much more easily sorted out when you have face-to-face contact. So, a lot of, that's part of the reason why a lot of our contact is face-to-face. We would have, not so much recently, we would've, we would've had a lot of planning and strategic meetings.

Since the planning meetings and most of the subsequent face-to-face meetings were in the city where OptomNGO is based and NEuro, effective negotiation of individual roles and network norms among these individuals was possible. According to McKenney et al (1992) and Nohria and Eccles (1992), robust relationships and identities are established through rich communication, particularly through face-to-face communication, that allows for individuals to receive the full range of information about those with whom they are communicating in order to gain a fuller picture for developing effective strategies for interaction. Robust relationships among network members, shared knowledge and meanings with regard to the context, and the negotiation of their identities and roles in the network, are essential (Nohria and Eccles, 1992). A project member involved in the co-ordination of project activities in Tizangara explained:

DNO Core Management 3: But they already know me and I already know everyone, even we are distant. I already know the reaction of him, why he did that because I know him...most of them, we already know

personally...each person is different...to each person you have to go in a different way.

Another factor that emerged as important for effective communication in the network is that simply having the opportunity for face-to-face communication is not sufficient. Individuals require the social skill to be able to read others' verbal and non-verbal communication in order to form 'accurate' impressions and develop effective strategies for interaction. One core DNO member at OptomNGO pointed this out:

DNO Core Management 4: Yah, and at the start as well, while we may know each other in organisations, I think also deep down we need also be able to assess each of the partners coming to the table. Er, what is their commitment and what is their interest in getting involved in this partnership...

As alluded to earlier, telephone communication (landline and mobile) was also reported as important for facilitating more effective co-ordination and was useful for situations where face-to-face communication was not possible. Telephone communication was described as being a lot cheaper than having to travel to the different countries to conduct face-to-face meetings, as stated by one of the core project members based at OptomNGO:

DNO Executive Management 1: The phone is my most valuable asset...But, if you look at it, even if I spend 10 grand on, a month on a phone, [in fact] the cost for one flight is that, you know. So, my carbon footprint is decreased.

Mobile telephony was especially popular in Mozambique. All of the project members based in Tizangara always carried their mobile phones with them and often called each other when something was needed or to arrange a meeting. Other than calls, which were relatively costly, text messaging and chatting via Blackberry chat (BBM) or Whatsapp were utilised often even between the optometry students and lecturers. The culture of using mobile telephony was more established than a culture of using e-mails. During their everyday activities, two of the female optometry lecturers, chatted on BBM and checked their Facebook pages on their Blackberry mobile phones. Interestingly, all of the high level individuals I interviewed in Mozambique (e.g. Director of Medicine at the hospital and a Director in the Department of

Science, Technology and Innovation) had a landline in their offices and two mobile phones that they kept on the desk in front of them during the interview, and both the landline and mobile phones rang and/or vibrated during the interview. Text messaging was also utilised very often. For example, in arranging a meeting with a Director in the Department of Science, Technology and Innovation, I liaised with her personal assistant via text messaging, as she was not proficient in English, and I did not speak Portuguese well enough to liaise with her over the phone. We liaised in Portuguese via text messaging. I had sent the Director an e-mail to request a meeting with her and she sent me her personal assistant's mobile number and requested that I liaise with her.

Since the lecturers and the Network Manager lived in close proximity to each other and Tizangara is a very small city, the Network Manager often visited the lecturers during lunchtime or at night to discuss project-related activities and deliver goods (e.g. mobile broadband devices).

Similarly, project members at OptomNGO emphasised the usefulness of Skype for internet calls and teleconferences via the internet more than project members based at the other institutions. As an international NGO with offices in several countries and a global resource centre sourcing goods worldwide, project members at OptomNGO reported using Skype a lot for their general work activities and not only for the MozOptom DNO. Communication via Skype was reported to be less costly than telephone communication and travel overseas. A project member at the level of management at OptomNGO stated: 'if it wasn't for Skype, I think my phone will be like 20, 30 thousand'.

These findings indicate that the culture of organisation and the wider social context influenced the selection of the modes of communication utilised. The role of culture as well as other aspects of the context that influenced communication, are discussed next.

9.2 The role of context: accessibility and culture

9.2.1 Access to ICTs and the role of culture

The potential for ICTs to facilitate communication, regardless of geographical location, is now widely recognised (Benkler, 2006; Shirky, 2008). Rapid advances in ICTs are making it increasingly easier for individuals in lower-income contexts to actively participate in global networks. Although ICTs are becoming increasingly available in lower-income contexts, access

to ICTs by all cannot be assumed (Benkler, 2006; Thompson, 2008). As indicated above, reliable access to the internet coupled with a culture of using the internet as a mechanism for communication, was essential in the MozOptom DNO. The circumstances of OptomNGO and the lead institution, and the broader country contexts in which they were situated – that is, an upper- middle-income and highincome countries -, satisfied these conditions. All of the project members based at these institutions had reliable access to the institutions' Internet networks, and each was assigned e-mail addresses and were linked to the institutions' intranet.

The core project members at the lead institution also communicated with the main funding agencies based in NEuro mainly via e-mail and telephone, but also face-to-face at the regular formal meetings part of the monitoring and evaluation of the project. For these lines of communication, 'picking up the phone' was also described as a mode of informal communication (Interview, HEA 1, HEA2). Telephone calls were also used as a way of confirming receipt and the intended interpretation of important information. A project member at one of the funding institutions in NEuro stated:

HEA 1: We tend to use the phone, the way I would use it is if we send an e-mail, you would just follow it up with a phone call because sometimes the information we are looking for maybe a little bit detailed or if theirs is any risk that they may have misinterpreted...

On the other hand, UniUS had access to relatively fast Internet since the new undersea cable was laid around the African coast, but mainly due to financial constraints, Internet access was unreliable and limited. The lecturers at the university were provided with wireless Internet at their apartments and at the university. However, they complained often about the Internet being down for several weeks at a time. Since the lack of access to the Internet hindered the optometry lecturers' ability to keep contact with project members based outside of Mozambique, and thus impeded their access to course materials provided by OptomNGO, they were provided with prepaid mobile broadband which they could utilise when the wireless Internet provided by the university was not working (fieldnotes 27 May and 29 July 2011).

In contrast to the virtual network set up at NEuroIT and OptomNGO, only the management at UniUS were assigned e-mail addresses, whereas the other staff who used e-mail, used their personal e-mail accounts (Interview, Lab Technician 1). Not all of the students at UniUS had e-

mail accounts, which I found out when one of the students from the rural community near to the university requested that we keep contact. When I suggested that we communicate via e-mail, she stated that she did not have an e-mail account. Many of the students did, however, have e-mail accounts and a few regularly brought their laptops with to university. While students managed to access the wireless Internet at the university from their own laptops, it was university policy that only staff are allowed access to the wireless network and students were expected to use the computer laboratory. The students, however, complained, in the focus groups, that there was a relatively small number of computers in the laboratory and the time allowed for accessing these computers was restricted:

Optometry Lecturer 1: And even that few number of computers which exist, some computers are broken and the wireless also can only get access to those students who've got the laptop but not all of them also have got access to the password. So those are the constraints.

Individuals at the level of management at UniUS also had easy access to the Internet via their mobile phones, often Blackberry mobile phones. For example, whenever the Rector replied to my e-mails, it was from his Blackberry.

This observation was also made by some of the project members. For example, one of the core project members based in Tizangara complained to me about this issue one day (excerpt from my fieldnotes, 24 November 2011):

He also said that one of the frustrations he has with the university is that it's fine e-mailing the people high up in the university because they have Blackberry phones and other fancy phones so they reply immediately whereas the people at lower levels have to go to internet cafes or find another way to access the internet when the internet is not working at the university, which happens a lot. It's thus sometimes hard to make contact with people via e-mail.

Hence, there is some capacity for computer-mediated communication in Mozambique, but there is not a common culture of using e-mails – except at the level of management –, so project members sometimes do not respond or take a long time to respond to e-mails. DNO members at OptomNGO and NEuroIT reported being frustrated by how long it took to get

things done because of how slow things happened in Tizangara. In a conversation I had with a key project member involved in co-ordinating project activities in Tizangara, the DNO member told me that when he first arrived in Tizangara, he sent messages via e-mail to individuals at the level of management at UniUS,

'...he wasn't sure whether they had received his messages so he sent them each an e-mail and at the end of the e-mail he told them that he was going to print it as well and drop it at their offices.' (fieldnotes, 9 August 2011).

The reliance on mobile telephony also impacted on the ability of the DNO to document important conversations and decisions made, which is the norm (and thus the expected practise) in the organisations in the other Southern African country and NEuro. In complaining about the lack of culture of using e-mail communication in Tizangara, a core project member in Tizangara told me about how this impacted on the organisational memory (fieldnotes, 24 November 2011):

Here however people use mobile phones a lot but he has to have things in writing in case he needs to check it up later. If he sent a text message, it's difficult to have to look up the message if he needs it later.

Another factor that hindered communication between project members at NEuroIT and OptomNGO and project members at UniUS is the language difference.

9.2.2 Influence of language difficulties on the selection of modes of communication

A reason mentioned by one of the project members at OptomNGO for e-mail communication between members at NEuroIT and OptomNGO and members at UniUS not being very effective is the fact that members at NEuroIT and OptomNGO do not speak Portuguese and English is not widely spoken in Tizangara. The problem was described by a core project member at NEuroIT:

DNO Core Management 1: e-mails mainly, but that proves difficult in UniUS because of the language barrier and, and that kind of thing.

The perceived language barrier also hindered face-to-face and telephonic communication. This was discussed in detail in the previous chapter.

9.3 Conclusion: communication for co-ordination and co-operation

This section showed that both computer-mediated and face-to-face communication was essential for supporting DNO activities (cf. Holohan, 2005). It is apparent from the discussion above that the modes of communication selected should support the immediate needs of the DNO. Face-to-face communication was essential for supporting institution-building processes and conflict resolution as these modes of communication provided the widest range of information about the individual and the context, as well as direct feedback (see Berger and Luckmann, 1967). Hence, face-to-face communication was effective for 'context creation', whereas e-mail communication was 'context-dependent' (see McKenney et al, 1992). Also, access to ICTs was not sufficient in facilitating the use of computer-mediated communication, a culture and willingness to utilise this mode of communication was also necessary. This has been pointed out by authors emphasising the embeddedness of ICTs (e.g. Sassen, 2002). As Symon (2000) indicates, this culture can be developed through interaction. There was, however, a culture of communicating via mobile telephony (e.g. using a Blackberry to send e-mails, text messaging, etc).

Chapter 10 Conclusion

In this thesis, I address two issues:

- the role of new network organisational forms in science, technology and innovation (STI) capacity-building, specifically as strategies employed by African universities in contributing to economic and social development in their local contexts (i.e. in fulfilling their developmental role in society); and
- the lack of appropriate analytical tools for analysing these new organisational forms emerging in development.

These issues are addressed through the exploration of a 'North-South' development project, from a network perspective. The research thus starts with the premise that development is rooted in social networks (Bebbington and Kothari, 2006) and is shaped by the values, ideas and actions of the individuals who are tasked with carrying out development initiatives and those who the projects are intended to benefit. From this perspective, development is understood to be a socially constructed process and thus development outcomes or 'products' would be socially constructed (Long, 2001; see also MacLachlan et al, 2010; Mosse, 2005).

The case study analysed for the purposes of the research is a transnational inter-organisational network aimed at developing optometry-related STI capacity in Mozambique. I call this type of network a development network organisation (DNO) because it portrays specific qualities akin to network organisational forms that are now ubiquitous in business (see Borgatti and Foster, 2003; Nohria and Eccles, 1992; Powell and Grodal, 2006). Network organisations are new organisational forms that have emerged in the current economy as a result of the rise in globalisation and rapid advancements in ICTs, which now drive development in the current economy (see Benkler, 2006; Castells, 1999, 2000a, 2000b; Hardt and Negri, 2000). Some authors have indicated the emergence of network organisational forms in the field of development as well, highlighting the potential of these organisational forms for accelerating development (e.g. Bebbington and Kothari, 2006; Chataway et al, 2005, 2010; Holohan, 2005).

The characteristics of DNOs are discussed in more detail later in this chapter. Considering that 'development' is a controversial concept that means different things to different people, the concept of development, as it is understood in this thesis, is briefly reviewed, followed by an elaboration on the 'networked' development model that has emerged in recent years. The

discussion then shifts from the focus on 'network as metaphor' to 'network as measure'. The network-institutional approach proposed in this thesis is firstly defined. Secondly, the advantages of this approach for analysing DNOs are discussed. The findings of the present research illustrate the relationship between network structure, and institutions and agency, which is not well-understood in the social network analysis literature (see Mische, 2011). Also, the usefulness of network theory for understanding how DNOs emerge and what drives DNOs is discussed.

The well-developed theory on and methods for analysing network structure – specifically role theory and the theory on network flows (and social capital) – is an advantage of formal social network analysis (or structural network analysis). Structural network analysis also allows for a sophisticated investigation of structural power through tools available in the social network analysis (SNA) toolkit. The advantage of Fligstein and McAdam's (2012: 9) theory of fields is the elaboration on the concept of 'the strategic action field' – specifically, the notions of social skill and embeddedness (i.e. relations between the field of interest and other fields that may be inter-dependent or distant). Each of these aspects is discussed below, drawing on the main findings of the present research.

Since the research was conducted within a grounded theory approach, the theoretical understanding of DNOs presented is grounded in the analysis of the primary data collected. The grounding of the knowledge produced here from the 'thick' (Geertz, 1973), 'fine-grained' relational data (Padgett and Powell, 2012) on STI capacity-building is the second main contribution of the present research study to the literature. As indicated in Chapter 1, a problem highlighted in the innovation studies literature is the dearth of empirical research on STI capacity-building networks and innovation, in general.

The description of how qualitative and quantitative methods can be utilised in a complementary way for analysing primary data is the third contribution of the research to the literature. Recently, authors have called for mixed methods research designs for enhancing the explanatory power of SNA.

10.1 Conception of 'development'

Drawing on Amartya Sen's definition of 'development', in this thesis, 'development' is defined in terms of improvements in the accessibility of essential services and resources (e.g. health

and education services, venture capital for entrepreneurs, etc.) as well as the development of capabilities to access and utilise these resources. This is not confined to low-income countries, it is applicable in all countries. Although the focus of the thesis is on the role of development assistance, the definition is broad enough to apply to individual's personal development projects as well as development at the household, national and international levels.

From the discussion of the literature on innovation and development in Chapter 1, it is evident that development is multi-dimensional, encompassing economic growth, social development (health and education) and human rights (social inclusion). While low-income countries, like Mozambique, report the highest levels of 'poverty' and 'underdevelopment', it is becoming increasingly apparent that development objectives need to be pitched at different levels of social strata. In other words, the single, homogenous social group that development agencies often target does not exist. The World Bank (2008: 69), for example, distinguishes between four groups among the rural population (consisting of 70 % of the total population) in Mozambique: 1) 'extremely poor', 2) 'poor', 3) 'nonpoor', and 4) 'wealthy'. Here, those who are classified as 'extremely poor' are 'below half the poverty line', and those who are considered 'wealthy' are 'above 1.5 times the poverty line' (World Bank, 2008: 69). Joseph Hanlon (2007), a researcher in the area of development in Mozambique, indicates that differing degrees of poverty exists in Mozambique and there is a need to pitch development initiatives at these different levels. Some authors focussing on other low-income contexts in Africa agree (see for example, Leach and Scoones, 2006; Toivanen et al, 2012). The 'old' method of aiming to uplift the upper social strata to ensure economic growth, with the expectation that development at the top will eventually trickle down to the bottom, has been shown to be ineffective in reducing poverty (e.g. UNDP, 2010). Poverty has actually deepened in many low-income countries in Africa and inequalities widened, especially among urban communities (see UNDP, 2010). This is the situation in Mozambique (see World Bank, 2008; Hanlon, 2007).

Why is this the case? Hanlon (2007) suggests that a major reason for the current situation in Mozambique is that development initiatives tend to mainly benefit the small percentage of the population who are able to participate in the market, and largely neglect the very poor, who cannot use the market to their benefit as they lack the necessary capabilities and are more vulnerable to 'shocks' (e.g. health problems, droughts, floods, etc.). This situation was also highlighted by Ferguson and Lohmann (1994), who researched the impact of

development initiatives in Lesotho. Hanlon suggests that the introduction of a social welfare system that allows the very poor access to basic services (e.g. food, healthcare, etc.) and provides the means by which those who are very poor could begin to participate in the domestic economy, at least as consumers. Hanlon states that there is no other way to prevent those who cannot even feed their children, from slipping deeper into a state of poverty. He also indicates the need for greater emphasis on job creation so that young people finishing school can become productive members of society and as a way of building the local economy. These strategies are, however, counter to the neoliberal ideas promoted by international aid agencies on whose assistance the Mozambican government depends (Hanlon, 2007).

Castells (1999) provides a useful explanation for the widening social inequalities and increasing social exclusion globally, from a network perspective. According to Castells (1999), and some other globalisation theorists (e.g. Hardt and Negri, 2000), the current global economy is organised around global flows of resources and thus global networks. He refers to the current paradigm as the 'network society', which is characterised by unprecedented levels of global inter-dependence facilitated by information and communication technologies (ICTs). Inclusion and exclusion in the network society is based on contribution to global networks. Actors (i.e. individuals, organisations, communities and countries) who are included are those who can contribute through production and/or consumption, and everyone else is either marginalised (e.g. poor people) or left out (e.g. very poor people who cannot even contribute as consumers, criminals who deviate from values in the network society, etc.). Castells (1999) suggests that the extent of social exclusion in the current economy is so massive that excluded individuals can be said to constitute a 'fourth world', or what Saskia Sassen calls 'the Fifth Circle of Hell' (TCD/UCD Public Lecture Series, 15 January 2013).

Castells (1999) proposes two strategies for greater social inclusion and reducing inequalities: the development of adequate capabilities for information-processing, to enable direct participation in the economy, and the development of capabilities to participate through accessing useful local and global networks. In business/innovation terms, actors require the necessary 'absorptive capacity', which refers to the capacity to search for, access and apply information (and other resources) (see Cohen and Levinthal, 1990). The development of such capabilities depends on adequate ICT infrastructure and education, including the development of information-processing skills and cultural values important in the network society (e.g.

culture of learning). Low-income countries in Africa, however, have a double disadvantage in that they generally lack adequate information-processing capabilities as well as basic infrastructure (e.g. sanitation, transport, etc.). However, it has been highlighted in the literature recently that the development of physical infrastructure, while important, is not enough (see Chataway et al, 2005; Ferguson and Lohmann, 1994; Hanlon, 2007, 2009;). The capability to link into local and global networks has been found to be more important, especially for those at the very poor end of the scale. In general, those who do not have access to basic resources tend to rely on their relations to those who do, in order to gain access to essential resources.

For development in the network society, the emphasis is on participating and thus preventing marginalisation and exclusion. In this thesis, the use of different strategies according to the needs of different social groups is emphasised. Development has to be multi-dimensional and multi-level.

The MozOptom DNO aimed to address the urgent need for indigenous human resources, physical infrastructure and social capital. Hence, human capital, physical capital and social capital was shown to be essential. One component of the project included the development of entrepreneurial skills among the students and other members of the community through the use of a social entrepreneurship model. It also aimed to develop capacity at multiple levels. Generally, mainly those who are wealthy or at least not very poor have the capabilities to access services (e.g. attend university) and participate in development networks (see Castells, 1999; Hanlon, 2007). The MozOptom project also aimed to serve the needs of the poor and very poor by offering affordable or free eye care services in rural areas through their vision centres and through the students who assisted families in rural communities through UniUS's 'One Student One Family' programme. The project also has impact through the graduates produced, who would have the capabilities to improve their quality of life and that of their families. Individuals linked to them through their social networks may also be able to access optometry expertise through them, besides access provided through the vision service centres established by the project. During the fieldwork, I also observed how several friends, family members and other acquaintances of the students received free optometry services as volunteer clients with whom the students could practise. Community members also participated in free screenings through the various activities of the MozOptom project.

10.2 'Networked' development

Chapter 1 highlighted the growing importance of network organisational forms, especially those including local-foreign ties, as mechanisms for developing science, technology and innovation (STI) capacity.

Working through networked organisational forms is one strategy that African universities located in resource-poor contexts, utilise in serving the needs of the local context. Research on development networks, mainly aid-funded networks, indicate the role of these networks as 'pipes' through which knowledge and other resources are channelled so that they may become more easily accessible to those who need them (e.g. Chataway et al, 2005, 2010; Leach and Scoones, 2006). Here, the focus is on the structure of the network. Other researchers have emphasised the social construction of development 'products' through networks, indicating that development projects are produced and reproduced by the individual actors involved, including those implementing the projects and those targeted as 'recipients' (e.g. Long, 2001; Mosse, 2005). This highlights the 'embeddedness' of development networks in social institutions, and the role of power and human agency (see Leach and Scoones, 2006; Long, 2001; MacLachlan et al, 2010; Marjanovic et al, 2012).

In the 'networked' development model, the distinctions between 'giver and receiver' (Wilson, 2006: 5) or 'donor and recipient' are not relevant. Development is organised around the network logic of inclusion and exclusion, depending on contribution. Actors involved in a development network organisation (DNO), for example, is included because they have something to contribute to the DNO, something that is needed to achieve the common goal(s) of the network.

In the MozOptom DNO, the common overall goal was the development of capacity to provide optometry services to the public in Mozambique. The Director of the OptomNGO developed the idea for a multi-exit optometry training programme to address the urgent need for eye-care services in Lusophone countries in Africa. The organisation wanted to pilot the idea in Mozambique. It had the expertise to develop optometry education programmes and vision care centres in sub-Saharan Africa, but did not have the funding needed or the necessary tacit knowledge for working in Mozambique (drawing on Polyani's distinction between tacit and formal knowledge). Actors at OptomNGO thus sought to find partners with whom they could collaborate in order to bring the development project to fruition.

Around the same time, DevAid (the official overseas development assistance programme of NEuro) had developed a new strategy for meeting its development objectives. The main purpose of DevAid was to assist its priority countries in achieving objectives set out in the Millennium Development Goals (MDGs), as part of NEuro's foreign policy. The new strategy was to make strategic use of university networks for achieving DevAid's development goals. Since DevAid had not worked with universities in a co-ordinated, strategic way before, it sought the assistance of the local Higher Education Authority (HEA) in implementing the programme. DevAid, through the HEA, thus sent out a call for funding for development projects implemented by NEuro universities, in collaboration with universities in its priority countries.

OptomNGO recognised the opportunity to receive the funding it needed and approached the Rector of a young African university in Mozambique, who had previously expressed interest in the optometry training idea for expanding his university (UniUS). However, in order to obtain the funding, a link with a higher education institution (HEI) in NEuro was required as the DevAid-HEA funding call stipulated that the lead institution be a NEuro HEI. Through a link on another project, OptomNGO was introduced to key actors at NEuroIT who had wanted to participate in DevAid's new programme as an opportunity to develop a development agenda at NEuroIT. This also presented an opportunity for NEuroIT to improve its status as an HEI in NEuro. Winning a DevAid award was associated with status amongst HEIs in the HEI sector in NEuro because they had to compete against each other for the funding. NEuroIT brought in a fifth organisation, a well-established traditional European research university, for additional research expertise in order to strengthen its application for the funding.

Each of the organisations thus had their own 'development project' (Long, 2001) and opted to participate in OptomNGO's 'development project' as it was in line with their own. The common 'development project' negotiated among the key actors became the 'glue' that held each of the organisations in a 'collaborative space'. As discussed in Chapters 5, 7 and 8, each organisation involved depended on each other, and this interdependence was acknowledged by all involved.

I refer to this type of collaborative, mission-driven development initiative as a 'development network organisation', drawing on the concept of network organisation common in business (Borgatti, 2001; Powell and Grodal, 2006). Here, development network organisations (DNOs)

are temporary, umbrella organisations consisting of a group of autonomous organisations working towards the achievement of common development goals. DNOs are different from network organisations found in the field of business in one respect, DNOs are driven by a development mission (i.e. the provision of public goods) rather than the mission of commercial or private gain. Transnational development networks are only considered to be DNOs if they are 1) formally-constituted networks consisting of 2) a group of autonomous organisations 3) that depend on each other (i.e. are inter-dependent) for the achievement of a specific common goal or goals (i.e. are mission-driven). The emergence of DNOs in the field of developed has been spurred by the rise in globalisation, which has changed the field of development (e.g. the shift in power relations in the field of development assistance discussed in Chapter 1), and has been facilitated by advancements in ICTs that make possible the kind of communication and knowledge sharing required for such interdependent relations to be sustained for the duration of long-term development projects (see Bebbington and Kothari, 2006; Castells, 1999, 2000a, 2000b; Chataway et al, 2005).

I suggest the use of the term DNO rather than development project or 'North-South' development network as it avoids the 'donor-recipient' distinction that implies unequal power relations.

10.3 Structure as well as process

Taking the perspective that development is not only carried out by individuals through social networks, but is also shaped by the ideas, values and behaviours of these individuals, it is argued that a micro- and meso-level analysis of DNOs is required in order to understand the role that these networks play in the field. Taking an institutionalist approach to analysing a DNO provides a description of process that formal social network analysis cannot provide.

This is illustrated by a description of the process by which the MozOptom DNO was formed, thereby identifying the key elements of the DNO. Firstly, an *innovation broker* was needed to come up with a novel idea, identify the group of actors with the resources needed to bring it to life, and then get them to formalise into a formally constituted entity to execute the plan. The idea was then moulded to the group of actors (including the funding agencies) and a common goal or mission for the DNO was established. The identification of *a common mission* was the second process needed to produce and reproduce the field. This process involves defining the field or the purpose of the DNO. Although all of the organisations got involved in

the DNO because the common mission served their own interests in some way or another, this common mission had to be reinforced throughout the 'life' of the DNO, especially when new actors entered the field. In order to co-operate towards achieving the common goal, actors needed a personal sense of purpose and belonging as well. What emerged as necessary for actors to identify with the mission was the co-construction of meaning related to the common mission and how it relates to their interests. The shared set of meaning is referred to as a *common network identity*. Essentially, the DNO was the relational space at the intersection or overlapping areas of the different organisations. In order for this relational space to be perceived as the formally constituted entity that it was intended to be, it had to have a common identity to which the diverse group of actors could pin their interests and identities. The fourth process was the *negotiation of institutions* governing the network. These refer to the rules for acceptable behaviour in the DNO and the roles of each actor (individuals and organisations). In the process of negotiating shared meanings and identities, network members developed *a commitment to the organisation* and sense of *trust* and *loyalty* to each other, which facilitated their co-operation (cf Holohan, 2005). The *strategically skilled actors* in the DNO act as 'pillars' supporting these processes by fashioning shared meanings and identities in times of stability and crises. In states of stability and crises, the main task of strategically skilled actors is to facilitate co-operation. The strategies they used depended on their roles in the network, defined in terms of their official designations and structural positions.

10.4 Towards a network-institutional approach

The notion that knowledge and meaning, and thus social orders, are produced in social relations is a well-developed notion in sociological theory (see for example, Berger and Luckmann, 1967; Giddens, 1979). What network theorists add to this understanding is that social orders are more than just the 'sum of individual actors' personal attributes and internalised' institutions (Wellman, 1983: 162). From a network perspective, institutions present in social networks are shaped by social structure (Wellman, 1983). Essentially, what types of resources an actor can access are important and this differs by the position of the actor in the social structure (Padgett and Powell, 2012; Uzzi, 1996). Hence, social structure presents constraints and opportunities to accessing knowledge and other resources. Structural position also presents opportunities for the control of resource flows and communication, and thus the monopoly of power in social structures (see Brass and Burkhardt, 1992). Furthermore, an analysis of social structure can provide an understanding of how social

networks access new information and opportunities (e.g. Burt, 2005). However, exploring the transmission of resources through social networks and relating access to resources to structural position, is only part of the picture. The use of and, more specifically, emphasis on structural analysis and mathematical models is a common criticism of the social network analysis (SNA) literature (e.g. Fligstein and McAdam, 2012; Long, 2001). Network analysts too have noted this shortcoming (e.g. Watts, 2003,). Watts (2004) (among others) suggests that sociology can help in making SNA more relevant.

I propose the use of a network-institutional approach for addressing the problem of lack of adequate analytical tools for exploring the role of DNOs in STI capacity-building. This approach combines key ideas in the social network analysis and neo-institutionalist literature, specifically Fligstein and McAdam's (2012) theory of fields. The network-institutional approach was first introduced by Owen-Smith and Powell (2008) who conceptualised networks as transmission systems through which information flows ('pipes') and 'sense-making systems', that is, 'carriers of institutional effects' ('prisms') and social orders in which meaning is negotiated.

In combining key ideas in network theory and the theory of fields, here, networks are viewed as mesolevel social orders through which information and other useful resources can be transmitted, but also in which strategic collective action takes place. This conception thus moves beyond the understanding of networks as pipes and as 'carriers of institutional effects' (Owen-Smith and Powell, 2008: 595) to an understanding of networks as social orders in which social life or culture is produced through interaction (Mische, 2011), similar to DiMaggio's 'cultural production systems' (2011: 286-287). It delves into an exploration of 'measure and meaning' (Edwards and Crossley, 2009). This conception is also closer to Alfred Schutz's and Berger and Luckmann's (1967) understandings of how social life is socially constructed through the everyday lives of individuals. The development products of the MozOptom DNO – that is, the school of optometry, the optometry professional community, the vision care centres and the research outputs – are viewed as socially constructed cultural products.

The development and application of the network-institutional approach to the analysis of a development network organisation (DNO) is my contribution to the literature. How the network-institutional approach increases the explanatory power of social network analysis

(SNA), especially for investigating DNOs, is demonstrated in the discussion of the findings (see Chapters 5, 6, 7 and 8). This is also discussed below, highlighting the main findings of the research.

10.5 Networks as transmission systems and strategic action fields

In viewing networks as 'cultural production systems', we can understand the relation between identities, and institutions and network structure, drawing on the influential work of Harrison White (e.g. Mische and White, 1998). Identities refer to the 'sets of meanings' that actors use to define who they are and what they want in particular situations (Fligstein and McAdam, 2012). Different sets of meanings are assigned to different situations, indicating that we have multiple identities that we switch between. The signals of these identities are embedded in social interaction (Mische and White, 1998). Identity is thus what provides actors with a sense of belonging in a network, which Fligstein and McAdam (2012) refer to as a fundamental biological need. In DNOs, collective identity is essential as it is the 'sets of meaning' that facilitates the commitment and loyalty required to achieve the common goals of the organisation (Holohan, 2005). Developing a collective identity to which actors can pin their own sets of meaning is challenging in DNOs like the MozOptom DNO because of the cultural (i.e. organisational and ethnic) and language divides. Here, the social skill of strategic actors plays a pivotal role in bringing about co-operation. The concept of social skill was introduced by Neil Fligstein (2001; 2008; Fligstein and McAdam, 2012).

Furthermore, in conceptualising DNOs as transmission systems and strategic action fields, the human agency of actors is captured. Strategic action fields are fields in which strategic competition (Bourdieu, 1986) and collective action (more generally) takes place (Fligstein and McAdam, 2012). From a network-institutional perspective, actors in DNOs do more than perform predetermined roles and transmit information. They constantly work towards producing and reproducing the network while negotiating between serving the development project of the DNO and their own development projects (Long, 2001). They negotiate network institutions for facilitating co-operation, using the resources available to them (social capital, information and economic resources), and share and compete for resources (Fligstein and McAdam, 2012).

According to Fligstein and McAdam (2012), the negotiation of institutions, the sharing of resources and effective conflict resolution, all facilitate co-operation, which requires effective

social skill. The elaboration on the use of social skill by skilled strategic actors in networks is an advantage of Fligstein and McAdam's (2012) theory of fields. In elaborating on how collective action takes place in fields, Fligstein and McAdam's (2012) go beyond other institutionalist theories in explaining how fields emerge, are transformed and stabilise. In integrating their theory on social skill and role theory in social network analysis, the findings of this thesis elaborates further on the role of social skill in facilitating co-operation in fields (cf Martin, 2003).

10.5.1 Social skill and role theory

Fligstein and McAdam (2012) propose a theory on social skill for analysing how strategic actors bring about co-operation in strategic action fields (see Chapter 2). The theory provides an understanding of what actors *actually do* in networks, which is generally not given much attention in formal social network analysis (Edwards and Crossley, 2009).

The collective identity of the MozOptom DNO was related to the common mission of developing optometry capacity in Tizangara, Mozambique. The interlocking 'development projects' (Long, 2001) of each of the core organisations involved in the DNO were pinned to the collective identity:

- OptomNGO - pilot an optometry training model designed for Lusophone African countries
- UniUS - develop an optometry department at the university in order to expand the university
- NEuroIT - establish a development agenda at the university and raise the status of the university in this area

The main strategic actors tasked with the responsibility of facilitating co-operation were those at the intersection between the core organisations: the Principal Investigator, Network Co-ordinator, Network Manager and Training Co-ordinator. The first three actors were identified as central actors in the structural network analysis (in terms of degree centrality, closeness centrality and betweenness centrality). They constantly traversed organisational boundaries, working to facilitate the production and reproduction of common understandings and meanings and a sense of belonging in DNO. The role of the Network Manager as a bridging actor between the organisations, especially between the actors at OptomNGO and NEuroIT and the actors at UniUS, was particularly significant. The decision to recruit an expatriate from

Europe to take on such a central role in the DNO was criticised by some key actors at UniUS and OptomNGO. The previous Network Manager was a local person who had strong ties with the key actors in the DNO based at UniUS. He was not, however, able to act as an effective channel of communication between the core organisations, and was not able to facilitate co-operation within the DNO. In this instance, strong ties or bonding social capital was not sufficient for bringing about co-operation. Also, what the social capital analysis showed was that, in DNOs, bridging and linking social capital is required before bonding social capital can be developed.

A significant finding was that, during the period of emergence, institution-building was crucial and bridging actors played an important role in this process. The role of the Network Manager embodied the collective identity of the DNO, and the actor in this position was expected to use his/her social skill to fashion meanings and institutions that resonated with others in the DNO. This example shows how social ties can be transmission and sense-making mechanisms, and how both are important for facilitating co-operation.

Furthermore, the success of these actors in facilitating co-operation, that is, the extent to which their social strategies were effective, depended on the symbolic power that they held in the DNO (Hallett, 2003), and the extent to which they were 'trusted' by others in the DNO. In Chapters 5 and 7, I show that complete trust was not necessary for achieving co-operation, as is commonly reported in the mainstream social capital literature (see Serra, 2011). The perception of 'trustworthiness' was the most important factor influencing the decision to co-operate (cf Tomlinson, 2005; Ynalveza and Shrumb, 2011). The degree of trust established is related to the distinction between 'thick' and 'thin' ('arms-length') exchange described by Uzzi (1996). In the MozOptom DNO, relationships characterised by 'complete trust' were also characterised by 'thick' co-operation, whereas 'thin' co-operation followed the perception of trustworthiness (see Chapter 8). An example of the former is the relationship between the actors at NEuroIT and OptomNGO, and the relationship between Training Co-ordinator and management at UniUS. An example of the latter is the relationship between management at UniUS and the actors at NEuroIT and the Network Manager.

Both the social skills employed and the degree of trust that skilled strategic actors established in the DNO, depended on their role in the DNO. In other words, the social strategies they used to facilitate co-operation and the effectiveness of these strategies depended on their

structural position in the network. Moreover, the norms guiding behaviour in the network were also related to the structural position of the actor. Identities are embedded in roles and institutions are embodied in roles (see Berger and Luckmann, 1967). Each of the actors used empathy to inform the strategies that they employed. Fligstein and McAdam (2012) indicate that actors try to understand the reality of others in order to find ways to get them to co-operate. For example, the Training Co-ordinator drew on her own experience in dealing with the bureaucratic structures in the education system in Mozambique to understand the realities and thus actions of management at UniUS. Through showing an understanding of their situation, she was able to build strong ties with them, which facilitated their co-operation on certain activities, when co-operation was required. This was possible because of her role as the Training Co-ordinator, which meant that she was more integrated into the university system and thus her priorities were more aligned with that of the university. The Network Manager was also integrated into social life in Tizangara as he too was based in the city, but he was recruited specifically by NEuroIT to act as a bridge between the 'external' actors (NEuroIT and OptomNGO). He thus mainly used the strategy of brokering between the organisations in order to facilitate co-operation and fashion the collective identity of the DNO. His role was tied to the identity of the DNO rather than the university.

However, because the DNO consists of inter-dependent relations among NEuroIT, OptomNGO and UniUS, ensuring co-operation on all sides was essential. As Network Manager, he had to ensure co-operation among the actors and ensure that the project was kept on track. He thus held a results-driven approach, which was typical among development workers because they are generally held accountable for the effectiveness of the project. This approach did, however, negatively impact on the relationship between the management at UniUS and the Network Manager as they felt that he did not quite understand their reality. They found it necessary to work within the system and make incremental changes that the system could handle. The incremental changes would bring about long-term change (see also MacLachlan et al, 2010, for a discussion on the need for strategies emphasising incremental changes). While the Network Manager reported that he sometimes understood the decisions of UniUS, his job was to make sure that the DNO delivered on its objectives, which required that each of the actors fulfilled their roles. This shows how the social skill he employed was tied to, and in a sense constrained by, his position in the network.

10.5.2 Power and governance

Similarly, an important finding was that power was related to network position, and thus the ability to use social mechanisms of control depended on network position. This was best illustrated by the crises period experienced in the MozOptom DNO due to the conflict that arose as a result of the inability of UniUS to produce graduates below degree-level, which was one of the initial key deliverables of the project.

According to Fligstein and McAdam (2012), incumbents in fields are those holding the most power and thus more influence in the field. Incumbents work towards reproducing their agenda and their positions in the field. Challengers, on the hand, take what the system gives and wait for an opportunity to shape it to serve their needs (Fligstein and McAdam, 2012). In network theory, Barabasi (2002) presents a similar argument, indicating that networks often include hubs that tend to be more influential in shaping the network. In the MozOptom DNO, the alliance between NEuroIT and OptomNGO was 'the hub' with greater influence in the DNO. Since the Network Manager was recruited by NEuroIT and was formally affiliated with the OptomNGO in that he was also the NGO's 'Mozambique Office Manager', his role was to serve the needs of the incumbents.

During the second year of the project, it became clear that UniUS could not contribute to the project as set out in the project proposal. The initial aim of the project was to produce a multi-level training programme and UniUS was supposed to take the lead on that. The education law in Mozambique changed and they were no longer allowed to offer courses below degree-level. They neglected to flag the problem to the other organisations in the DNO. Key actors in the NEuroIT-OptomNGO alliance then threatened to take the project elsewhere, thus threatening to exclude UniUS from the DNO if it did not produce graduates at technician level or find another way for the DNO to produce optometry technicians. Rather than comply, UniUS resisted but managed to negotiate a new 'deal', requiring a renegotiation of the Memorandum of Understanding (MoU). Since it was not in the best interest of NEuroIT or OptomNGO to start the project elsewhere as it would mean that resources would have been wasted and a new partner organisation would have to be found, they opted to renegotiate the MoU. What this scenario showed is the degree of interdependence among the actors and that the differences in power held were related to the actors' relative network positions or statuses in the network. It also showed that, besides the power related to the control of resources, interdependence was another currency of power. An important finding was that

the condition of high levels of interdependency weakened the power of dominant actors in the DNO in that it increased the willingness of the actors to negotiate and compromise. This is indicated by the 'institution-building moment' in the DNO, described in Chapter 7. This is an important finding since development projects are often mainly described in the literature in terms of unequal power relations related to the control of resources.

10.5.3 Interlocking development projects, the role of human agency

The discussion above shows that actors in DNOs are not passive. They have the ability to exercise their agency, regardless of their position. According to Giddens (1979), the very fact that actors decide to participate in a network indicates that they have agency and thus, some sort of power. Furthermore, the idea of each actor (in this case, organisations and individuals) carrying their own 'development projects' into the network is especially useful for understanding the competing development objectives of actors and the human agency they exercise in working towards ensuring that the 'development project' of the network benefits their own 'development projects' as well (see Long, 2001).

As indicated above, rather than abandon the MozOptom project or agree to work towards achieving goals that were not aligned with their own, each of the key actors in the core organisations worked towards ensuring that the 'development project' in which they agreed to participate also served the needs of their own 'development projects'. This implies that challengers have greater power in fields than Fligstein and McAdam (2012) suggest. Rather than simply taking what the system gives until there is an opportunity to challenge the status quo, as Fligstein and McAdam (2012) suggests, challengers (like incumbents) actively work towards ensuring that their own needs are met in some way through their participation in the field.

10.5.4 Fields embedded within fields

The notion of fields being embedded within fields, which is emphasised by Fligstein and McAdam (2012), is useful to thinking about networks in two ways. Firstly, it solves the boundaries problem of social network analysis (see Knox et al, 2006). According to Fligstein and McAdam (2012), a strategic action field consists of a group of actors who interact or collaborate regularly on specific activities. Those who are involved in the activities, but not on a regular basis, are either included as part of interdependent or distant or state fields. Secondly, field theory emphasises the influence of other fields, thus necessitating the

consideration of the impact of external fields on the field of interest. Fligstein and McAdam (2012) indicate that the exploration of the impact of external fields is often not done in practice as it involves the collection of more data, which is not always feasible. In the present research study, it would have been impossible to properly understand power and resistance in the MozOptom DNO without the consideration of how inter-dependent and state fields impact on the DNO.

Research on 'North-South' networks in the field of development shows that the same 'old' power relations that have always been associated with 'donor-recipient' relations continue to exist, despite the shift in discourse to 'networks/partnerships' and 'ownership' in the international aid community, as communicated in the Paris Declaration on Aid Effectiveness 2005 and the Accra Declaration 2008 (see Edejer, 1999; Junghanss, 2005; MacLachlan et al, 2010).

The 'old' institutions associated with these relations were introduced into the MozOptom DNO through the inter-dependent field of the funding agencies. According to Padgett and Powell (2012), institutions in networks are generally transmitted or transposed from other social networks in which actors are involved. The DNO included a group of organisations working together in an interdependent way, operating alongside the hierarchical structure of the larger aid programme in which it was embedded. The traditional institutions related to 'donor-recipient' relations were embedded in the hierarchical relations and negatively impacted on the DNO. The funding agencies used the traditional funding model of working through the European lead institution, putting them in control of the funding and holding them accountable for the project. Interestingly, Burt (2005) states that although networks generally have more vertical lines of reportage and they rely on social mechanisms for control rather than legally binding contracts, accountability still generally runs through hierarchies. The arrangement of having a hierarchical structure of accountability operating alongside a network structure is thus not peculiar to networks like the MozOptom DNO. However, the fact that the decision of who would control the budget and who would be responsible for coordinating project activities was made in an external field rather than through consensus among actors in the network, complicated co-operation in the network. This implies that in order for the discourse of equal relations to translate from aid policy to development practice, the boundaries of the network has to be respected and the ownership needs to be handed over in full. Decisions related to authority and the control of resources has to be taken by

consensus rather than being externally determined. This requires a complete rewiring of development assistance rather than simply a change in rhetoric and increased co-ordination and accountability, which is what the Paris Declaration of Aid Effectiveness 2005 is expected to achieve (cf Hall, 2002).

Another external field that impacted on the activities of the MozOptom DNO was the other actors involved in the field of eye care in Mozambique. The MozOptom DNO worked through the eye care coalition, essentially borrowing their social capital in the field, to improve its status and thus its influence in the field. Getting the coalition to recognise the legitimacy of the DNO in Mozambique was important for increasing the DNOs influence in the field.

Gaining the recognition of the Ministry of Health, specifically the National Eye-care Co-ordinator, and the ophthalmology professional community was more difficult. At the time of the research, the MozOptom DNO was still in the process of negotiating a place for optometry in the public system, with the relevant actors in the field. Some ophthalmology professionals had agreed that optometry could play an important complementary role, while others had not. The dominant opinion from the State and dominant actors in the ophthalmology professional community was that the optometrists produced by UniUS had to have additional ophthalmology training in order to be of use to the public system. They may thus eventually influence the curriculum of the optometry course at UniUS. Exactly what the outcome of the negotiations will be is uncertain.

10.6 What does this mean for STI capacity-building?

A question posed by researchers in the field of innovation and development recently is whether new networked organisational forms, like development network organisations (DNOs), emerging in the field of development recently, can be used to accelerate the development of STI capacity in resource-poor contexts (see Chataway et al, 2005, 2010; Leach and Scoones, 2006). What the present research study shows is that it can, with the use of an effective strategy for employing DNOs as units of production for development.

The research identified facilitators and barriers to the functioning of the MozOptom DNO (see Chapter 7). The analysis of how the exogenous and endogenous threats hindered the functioning of the DNO and the factors that were crucial for the effective operation of the DNO, presents lessons that are useful for developing an effective strategy.

10.6.1 Facilitators and barriers to the effective operation of DNOs

The main advantages of the network organisational design of DNOs, for achieving development goals, include the sharing of risk, and the opportunity to pool resources and benefit from the complementarity of assets. The network logic of including (and excluding) actors in the DNO according to their potential contribution to the common goals of the DNO is advantageous for development. In order to effectively use these benefits for accelerating development goals, the actors coming together to pool and share their resources, have to work together in a collaborative manner. Effective co-operation is the most important indicator of the effectiveness of the operation of DNOs.

In order for actors in DNOs to co-operate with each other, they need to show a high level of commitment to the DNO, which requires identification with a common mission. The common mission identified at the start of the DNO acts as the 'glue' that holds the actors in the collaborative space of the DNO. A common mission is a crucial characteristic of DNOs that facilitates co-operation. The high levels of interconnectivity, due to the high levels of interdependence among the actors in DNOs, provides plenty of opportunity for actors to negotiate effective institutions and trusting relationships for working with each other. An effective bridging actor is essential for fashioning a shared identity, creating a sense of belonging among actors in the DNO, and facilitating the negotiation of network institutions.

Due to the high levels of interconnectivity among actors in DNOs, information and resources can be passed through the network relatively quickly. This does, however, point to the importance of a suitable organisational structure to facilitate the information-processing requirements. Organisational designs that include teams or sub-networks facilitates the efficient processing and sharing of information as no single actor is responsible for all of the information processing and sharing responsibilities in the network. This feature of DNOs contributes to the resilience of the DNO.

Another major facilitator of the effective operation of DNOs is the recognition of the interdependence of the actors in the network, on each other, for achieving their common goals. I refer to this recognition as 'network consciousness'. DNOs that have a high degree of 'network consciousness' are characterised by a culture of openness to sharing information and resources, compromise, and transparency – which are essential for co-operation.

Also, since actors are highly dependent on each other, regardless of their position or status in the DNO, the power held by individual actors becomes diluted, to an extent. Hence, in 'North-South' development networks, the power of actors that traditionally hold greater influence is weakened. This situation results in greater openness to compromising and finding solutions that are of mutual benefit. It may, however, also lead to a situation where the activities of the DNO are delayed due to resistance or avoidance behaviour by some actors.

Two other factors that present obstacles to collective action, and thus the functioning of DNOs, include: the funding model that gives 'Northern' organisations control over the funding and co-ordination of DNO activities, and the core management team's results-driven approach to managing the network. These are typical of development assistance models. The findings of the research indicate a need for a shift in thinking about and managing development in practice (cf Hall, 2002; MacLachlan et al, 2010; Mosse, 2005). What is problematic about this typical funding model and results-driven approach is the association with unequal 'donor-recipient' relations. The institutions associated with traditional 'donor-recipient' relations (e.g. 'donors' taking control of the agenda) tend to hinder the building of social capital and thus co-operation.

Further barriers may be presented by differences in culture and language in the local context, and changes in the policy environment (e.g. the change in education, in the case of the MozOptom DNO). Power dynamics among elites in the local context may also present obstacles to the achievement of DNO goals.

10.6.2 Recommendations for development practitioners, from a network-institutional perspective

One major lesson that can be learnt from the analysis of the MozOptom DNO is that the activities of the DNO have to be effectively grounded in the local context. What this means is that the actors of the DNO have to take into consideration the specificities of the local context that the DNO activities are expected to benefit. Flexibility and an open attitude to learning are important in this regard. The 'problems' identified and the 'solutions' put forward by the DNO have to be negotiated with the key actors in the local context. Simply including a 'local organisation' or local individuals in the network is insufficient.

Furthermore, bridging and linking social capital are required to bridge differences between actors in the DNO to facilitate active engagement in DNO activities and co-operation. An effective bridging actor is crucial. The actor should possess the necessary tacit knowledge of the cultures and contexts of each of the actors in the DNO, in order to act as an effect bridge. Hence, recruiting a local person to act as a bridging actor is not always the most suitable strategy. This strategy may actually have negative consequences, as shown in the case of the MozOptom DNO. Again, the needs of the network should guide the decision on who is most appropriate for the job.

In order to avoid the institutional effects of 'donor-recipient' relations being carried into the network, decisions related to the lines of authority and the division of labour have to be made by the members of the network. All decisions taken should serve the needs of the DNO in order to facilitate co-operation among DNO members towards achieving the common goals of the DNO. Most importantly, identifying and addressing the needs of the DNO requires cognisance of the objectives of the actors in the DNO and the institutional contexts of the DNO.

The stage of emergence of the DNO is most crucial. When actors are brought together to form the strategic action field of the DNO, it is important that they start with a 'blank slate'. Rather than having certain actors dictate the agenda or put forward network institutions that best suit them, it is important that the field takes shape around the negotiation of the common goals of the DNO, the boundaries of the network (i.e. who is best suited to contribute to the achievement of the goals and should thus be included), and the ways in which each of the actors are able to contribute. The responsibilities of each of the actors, including decisions about who will co-ordinate network activities, should be negotiated among the actors at the very beginning of the DNO. The assignment of tasks should be done based on who is best suited for the task rather than on status or externally-stipulated criteria. Basing decisions on the needs of the network is most important for effectively achieving the development goals of the network. It is important that network institutions are negotiated among the actors during the stage of setting up the DNO, considering that social mechanisms for control are more important in network structures than in hierarchies.

Lastly, both face-to-face and computer-mediated modes of communication are important for collaborative action. Reliable access to ICTs is essential for using e-mail and text messaging technologies to facilitate the necessary communication across organisational and geographical

boundaries. These modes of communication are more suitable for routine operations, only after network institutions and the responsibilities of each of the actors have been negotiated. Also, the use of computer-mediated communication depends on the existence of a culture of using such modes of communication. The modes that are most suitable should thus be negotiated among the actors in the network. Face-to-face communication and other more direct modes of communication (e.g. telephonic communication) are crucial during the initial stage of setting up the network as these allow for the full range of personal information, and immediate feedback, to be transferred between the actors.

10.7 Limitations and directions for future research

All social science research studies are limited in some way. Two major limitations of the research are the restrictions in access to confidential information that only the core members were allowed to access, and the duration of the research. With regard to the former, mid-way through the research I was confronted by a problem that meant a trade-off had to be made between the independence of the research and greater access to the 'inner-world' of the core management team of the MozOptom DNO. In order to gain access to any documents and meetings not open to public access, I was required to sign a confidentiality agreement with the NGO and/or lead institution. This meant that the key actors at the NGO and lead institution may exercise some control over the data collection, analysis and dissemination. Considering that I already had access to all of the core members of the management team, who were all open to participating in the research, I decided to opt for preserving the independence of the research. I had a vantage point as an 'outsider', able to view the DNO from the perspective of each of the organisations involved, as I did not have any formal affiliation to either of them. That being said, network ethnographies conducted by individuals integrally involved in the management of DNOs, similar to the aid ethnographies emerging in the development literature, may yield greater insight into the inner workings of DNOs, thus shedding more light on the 'black box' of DNOs. It is, however, important that the research is not controlled or directed in any way by the decision-makers in the DNO. This is one way in which the research could be furthered.

If the researcher is an insider in the DNO, it may be easier to collect systematic relational data at several points in time rather than just at one point in time. The results could then be compared. This strategy was not feasible in the present research study due to the concern of collecting more data on an already over-researched group. Data collection would be easier

and less taxing on the participants if it was somehow built into the existing systems of the DNO. For example, the PhD student who was evaluating the MozOptom project was automatically included in certain meetings and e-mail communications.

The second major limitation of the research is that it only covers the first three years of the DNO and not the whole lifecycle of the DNO. Mapping changes in network structure and relational dynamics across the lifecycle of the DNO may provide further information on how networks are transformed and stabilise, and the role of social skill and power (see Fligstein and McAdam, 2012). The present research study did, however, capture the period of emergence, some incremental transformations (e.g. conflict and transformations related to this), a major crises period, and the stabilisation of the network. One part of the lifecycle was thus covered. The DNO experienced a number of changes soon after the survey was administered. The Network Manager and Training Co-ordinator left soon after the survey was administered. They had decided not to renew their contracts. The network dynamics of the DNO is thus likely to have changed. The need to bridge communication amongst the core organisations had been served. Towards the end of the research, all of the key actors met and negotiated project activities and the distribution of duties in the coming years. This was the first time that such a meeting had been held since the start of the project. There was a sense of stabilisation in the field.

Plans were in place to recruit a new Network Manager. S/he would have a different role to the previous manager. There was talk of a need for the new Network Manager to be a local person as the most pressing need that arose was advocacy and lobbying to get the optometry profession recognised by the Ministry of Health. The Network Manager would have to be fluent in Portuguese and English, be familiar with local institutions and government, and have influence in the local context. It would be interesting to explore the new dynamics among the actors. As Fligstein and McAdam (2012) points out, there is a need for research that takes a historical account of strategic action fields, and the analysis of the strategies that skilled strategically actors employ.

Another way in which the research could be furthered is through the use of different, perhaps more sophisticated, social network analysis methods. As Edwards and Crossley (2009) indicate, how qualitative and quantitative methods are brought together in social network analysis (SNA) is not prescriptive. The SNA toolkit includes a range of sophisticated research

methods providing different sorts of information about networks (see Borgatti et al, 1998). For the structural network analysis presented in this thesis, I relied mainly on measures commonly utilised for analysing network structure in collective action situations, which characterises development network organisations (DNOs). These measures include measures of centrality that allowed for the identification of channels of information flows, bridging actors, density and communication patterns (related to social capital) generally, and structural power. The methods utilised for structural network analysis were selected as complementary methods to the qualitative analysis.

Other SNA methods of analysis could also be used. For example, I relied mainly on the qualitative methods for exploring actors' roles in the DNO empirically. Blockmodelling, a method pioneered by Harrison White and his colleagues (see Boorman and White, 1976; Carrington et al, 2005; Scott, 2001), could be used to explore actors' roles further. The identification of different social groups within the network may yield interesting findings with regard to network structure (see Edwards and Crossley, 2009). An example of the use of sophisticated mathematical modelling for analysing collective action in networks is Floresa et al (2012), who employed Percolation Theory in exploring how the actions of one group of actors spreads to or are adopted by other groups.

Moreover, the present research study proposes a novel approach for addressing the gaps in knowledge about the role that development network organisations play in STI-capacity development, and how these organisational forms emerge and operate. Also, how they support African universities in carrying out their developmental role in society. An advantage of the analytical approach that I propose in this thesis is that its development is grounded in the empirical data. The research does, however, only focus on one case study. Further research is required to apply the framework to other empirical cases in other socio-economic contexts, and to the analysis of DNOs with different missions. Also, in terms of the developmental role of African universities, I proposed a more institutional understanding of the developmental role of these types of universities. My analysis also focussed more on the role that the African university played through its participation in the DNO. One way in which to further develop this area is to take a network-institutional approach to a more in-depth study on strategies that African universities employ in meeting the needs of and driving economic and social development in their local contexts.

The differences in network structure at the three points in time covered in the research could also be explored in further research. Due to the potential influence of mode effects, the analysis would require an investigation into the differences between the datasets on interaction. The analysis was beyond the scope of this thesis and will be explored in further research as it may provide an understanding of how the network evolved during the first three years of the project. Also, the temporal analysis will provide insight into the potential advantages and disadvantages of using different methods of data collection. Such an analysis is useful but is seldom done in social network analysis.

In the social network analysis literature, new methods and theories are emerging to increase the explanatory power of social network analysis. The present research study contributes to the emerging new conceptualisations of networks. I show how social structure, agency and institutions are linked, but the research focussed on a specific type of field with specific characteristics. It would be interesting to explore whether studies exploring the structure, dynamics and institution-building processes of a different type of field will have similar findings.

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Appendix 1 Interview guides

Interview guide for project members

I am conducting research for my doctoral studies. My main research question is: Looking through the perspective of a group of NGO workers and academics, what are the dynamics of development networks aimed at developing science, technology and innovation capacity in Africa? Part of the research is on the networks of the DevAid Programme of Collaboration.

The purpose of the interview is to discuss your experiences as a member of the [name of the project/management team]. Participation is voluntary and you are free to stop the interview at any time. Everything discussed will be kept confidential. Your names will not be used.

With your permission I would like to take an audio recording of the discussion for my own records. No one else will listen to the recording. Are there any questions before we start?

Questions:

- How did you become involved in project? What was your motivation for joining the project?
- The optometry programme is part of a wider project, the MozOptom project. What do you see as your role in the project? How do you think you fit into the project?

Experience of being part of the project:

- Can you tell me about your most positive experiences of being part of the project?
- Can you tell me about your most negative experiences of being part of the project?
- What has been the easiest/most challenging thing about teaching the students at UniUS? (Question for the project members involved in the training.)

Involvement in project and programme networks:

- Can you tell me about your relationship with members of other project funded under the DevAid programme? With whom do you have regular contact? What are the main modes of communication you use to keep contact with these individuals?
- Can you tell me about your experience of attending events and meetings organized by DevAid and the HEA, NEuro?

Communication and information flows:

- With regard to communication in the project. How often do you communicate with other project members? With whom do you communicate most in the project?
- What are the main modes of communication you use in keeping contact with project members?
- Can you tell me about information flows in the project? What sorts of information is communicated with you?
- The project includes four organisations. What do you see as the role of each organisation in the project?
- Can you tell me more about your experience of working with these organisations? What have been the easiest and challenging experiences of working with the different organisations - UniUS, NEuroIT, OptomNGO and NEuroUni?

Suggestions for improvement and general questions:

- What changes, if any, would you like to make to the project?
- In which ways, if any, do you think your university/organisation benefits from being part of the project?
- What do you think makes a successful network?
- What is your definition of development?
- What is your definition of capacity building?

Focus group discussion guide

Group: Students registered for optometry at UniUS

Place: Optometry Clinic/lecture room, Room 77, North campus

Date: Thursday, August 11, 2011

Times:

4th Semester students from 8:50 - 10:00am

2nd Semester students from 10:00 to 11:10am

6th Semester students from 11:10am to 12:20pm

Facilitator 1 and translator: Ronaldo Obi

Facilitator 2 (observer): Il-haam Petersen

INTRODUCTION (approximately 5 min)

Good morning/good afternoon. Thank you for coming today.

As you may know, I am conducting research for my doctoral studies. My main research question is: Looking through the perspective of a group of NGO workers and academics, what are the dynamics of development networks aimed at developing science, technology and innovation capacity in Africa? Part of the research is on the network of the MozOptom project (optometry programme).

The purpose of the focus group is to discuss your experiences of being an optometry student at UniUS. Participation is voluntary and you are free to leave at any time. There are no correct answers and every person's opinion is valuable. It is important to respect each other's opinions. Everything discussed will be kept confidential and anonymous. So, your names will not be used. You may use a pseudonym if you wish. Please say your name or pseudonym each time you speak.

With your permission I would like to take an audio recording of the discussion for my own records. No one else will listen to the recording. Are there any questions before we start?

DISCUSSION

1. Going around the room, give each person a chance to respond to these questions as a way of introduction (approximately 10 min):

- Please say your name or pseudonym you wish to use, where you are from and how it is that you came to study optometry (i.e. how did you decide to study optometry, why optometry).

2. Questions for open discussion (40 min):

- Can you tell me about your positive experiences of being an optometry student at UniUS, if any?
- Can you tell me about your negative experiences of being an optometry student at UniUS, if any?

Probing questions:

- What are the challenges you face as an optometry student at UniUS, if any?
 - Can you tell me about your relationships with your lecturers and any other staff of the MozOptom project with whom you have contact?
 - Who is the most important person helping you with your studies?
 - If you find that you need information or help with your studies, how easy is it to access people or the information you need?
 - What are the main modes by which you communicate with your lecturers and other staff of the MozOptom Project?
 - What is your assessment as to the way the optometry programme is organized? Do you have any suggestions to improve the organization of the programme?
 - Is there anything that you would change about the optometry course? If so, what changes would you make?
3. What is your opinion of the MozOptom Project that the optometry programme forms part of?
4. What is your understanding of where you fit into larger project of the MozOptom project?
5. What is your understanding of where you fit into development in Mozambique?
6. What do you plan to do after you graduate?
7. Is there anything that you would like to add or ask?

Appendix 2 Online survey questionnaire

[DevAid Programme of Collaboration] Networks Survey

Questionnaire on the networks of the [DevAid Programme of Collaboration]

Thank you for participating in this survey! The survey should take 10 - 15 minutes to complete.

It is important that individuals involved at **all levels** within the [DevAid Programme of Collaboration] (e.g. Principal Investigators, administrators, project managers, PhD students, lecturers, etc.) complete the survey. **Each person's response is valuable.**

Aim of the research

The research forms part of a PhD study exploring the dynamics of relations among a group of academics and NGO workers involved in 'The [DevAid Programme of Collaboration between Higher Education Institutions]'. A big part of the research is to map out the communication networks within this programme.

Besides being useful for the PhD research, the mapping may be very useful for the individual projects as it will provide a visual map of the networks, and information about information flows and key actors within the networks.

The survey

In order to map out communication within the network, you will need to provide your name when completing the survey. Once put together for the analysis, you will be assigned an alphanumeric code name according to your institutional affiliation. This code name (and not your name) will be used in the analysis and visual maps of interaction among project members, which may be published. The actual data file including your name will be kept confidential and only I will have access to the file.

Completing this survey indicates your consent as a participant in this study.

The results of the survey will be made available to all project members. If you have any questions, suggestions or comments please contact:

Il-haam Petersen

PhD Student

Department of Sociology

University of Dublin, Trinity College

E-mail: petersei@tcd.ie

*It is important that you click 'Next' at the end of each page to save your responses before exiting the survey, and that you do not use the back arrow in your browser to click back to previous questions.

[DevAid Programme of Collaboration]: Projects

Please provide the following information:

Name

Age

Job title

Institution/organization

Please select one of the projects/teams you are currently part of or were part of in the past by clicking on the appropriate option.

- [Project 1]
 - [Project 2]
 - [Project 3]
 - [Project 4]
 - [Project 5]
 - [Project 6]
 - [The Mozambique Optometry Development Project (MozOptom project)]
 - [Project 8]
 - [DevAid]
 - [HEA (NEuro)]
 - [None of the above]
-

The Mozambique Optometry Development Project (MozOptom project)

What is your role in the project?

- Project administrator
- Principle Investigator
- Project coordinator
- Project manager
- Executive/Steering Committee member
- International Advisory Board member
- Trainee/PhD student
- Training facilitator/lecturer/course coordinator
- Reporting Officer
- Supervisor (of trainees or PhD/masters students)
- Other

Please specify:

At what stage in the project life did you join?

- Proposal writing
- Implementation Year 1
- Implementation Year 2
- Implementation Year 3
- Implementation Year 4
- Implementation Year 5
- Other

Please specify:

Interaction with project members (April 2010 - March 2012)

On average, how often do you communicate with each person below with regard to project-related topics? Communication can be face-to-face meetings, phone calls, internet calls, text messaging or e-mails.

	Never	Once or twice a year	Quarterly	Once or twice a month	Weekly	Daily
[List of project members]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please state the name(s), surname(s) and institutional affiliation(s) of **any other individuals** in the project with whom you communicate about project-related topics.

Listed below are some of the resources provided by the project. Please rate the usefulness of each resource with regard to project activities.

	Never used	Not useful	Useful	Very useful
Events (e.g. lecturers, seminars, etc.)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Dropbox (or equivalent)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bulletin, newsletter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flickr	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Project website	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

E-mail updates, notifications	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Moodle, Blackboard	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Googlegroups, Yahoo!groups	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Social networking tools (e.g. Facebook)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Twitter	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please specify.

Please indicate the three modes of communication you use most often in communicating with each of the project members with whom you interact (April 2010 - March 2012).

Phone calls	Text messaging	E-mails	Face-to-face meetings	Internet calls, chat (e.g. Skype)	Social networking (e.g. Facebook, Twitter)
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[List of project members]

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Other

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
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Please state the name(s), surname(s) and institutional affiliation(s) of **any other individuals** with whom you communicate about project-related topics, and **the three modes** of communication you use most often in communicating with each individual.

Please select the individuals you turn to first, second, third and fourth for input prior to making an important decision with regard to project-related activities (April 2010 - March 2012).

	First	Second	Third	Fourth
[List of project members]	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please state the name(s), surname(s) and institutional affiliation(s) of **any other individuals** you most often turn to for input prior to making an important decision with regard to project-related activities.

Informal relationships

Are there any individuals in the project with whom you socialise or chat about non-work or personal topics? If so, please select the individuals from the list below. (April 2010 - March 2012)

- I do not socialise with individuals in the project
- [List of project members]
- Other

Please state the name(s), surname(s) and institutional affiliation(s) of **any other individuals** in the project with whom you socialise or chat about non-work or personal topics and the frequency of these interactions.

Project Promoters'/Leaders' Group and other projects part of the [DevAid] Programme of Collaboration

Do you have contact with members of any of the other projects which are part of the [DevAid Programme of Collaboration], [the HEA] and/or [DevAid]?

- Yes
- No

[If yes] Please indicate the frequency with which you communicate with each of the members of the [DevAid Programme of Collaboration] listed below.

	Never	Once twice year	or a	Quarterly	Once or twice a month	Weekly	Daily
[List of project members]	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Please state the name(s), surname(s) and institutional affiliation(s) of **any other individuals** in the project with whom you communicate about project-related topics.

Are there any other projects/teams you are currently part of or were part of in the past?

- Yes
 - No
-

[If 'Yes'] Please indicate one other project/team you are currently part of or were part of in the past by clicking on the appropriate option. (Please only select a project that you have not previously selected in the questionnaire.)

- [Project 1]
- [Project 2]
- [Project 3]
- [Project 4]
- [Project 5]
- [Project 6]
- [The Mozambique Optometry Development Project (MozOptom project)]
- [Project 8]
- [DevAid]
- [HEA (NEuro)]
- [None of the above]

[Individuals involved in other projects as well will complete a similar questionnaire for each project in which s/he is involved.]

Thank you for your participation! Is there any other information that you feel will be useful to know with regard to the [DevAid Programme of Collaboration]?

End of survey. Thank you!

The results of the survey will be made available to all project members. If you have any questions, suggestions or comments please contact:

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