

GLEND A KRUSS • MICHAEL GASTROW

Linking universities and marginalised communities



SOUTH AFRICAN CASE STUDIES OF
INNOVATION FOCUSED ON LIVELIHOODS
IN INFORMAL SETTINGS

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Acronyms and abbreviations

ARC	Agricultural Research Council
DAFF	Department of Agriculture, Forestry and Fisheries
DHS	Department of Human Settlements
DST	Department of Science and Technology
ICT	Information and communications technology
IDC	Industrial Development Corporation
IDRC	International Development Research Centre
IID	Innovation for Inclusive Development
IKS	indigenous knowledge systems
MPA	marine protection area
NGO	Non-governmental organisation
NRF	National Research Foundation
OECD	Organisation for Economic Co-operation and Development
R&D	research and development
SARChI	South African Research Chairs Initiative
SEDA	small Enterprise Development Agency
SMME	Small, medium and micro-enterprises
TIA	Technology and Innovation Agency
UNIID	Universities and Innovation for Inclusive Development

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The UNIID Africa Project

With the economic crises, contestation about the role of universities in industrial and other innovation processes has shifted. The emphasis in the past has tended to be on whether and how universities should support economic development and growth through industrial innovation processes, and what research, new knowledge and technology can contribute, particularly in relation to high-technology formal sectors. Much research centred on how to enhance technology transfer, establish effective incubation facilities, support patents and licensing, or other forms of profitable commercialisation of intellectual property.

Such a discourse tends to obscure a more inclusive and developmental form of engagement and interaction that could contribute to innovation and economic development. In countries that belong to the Organisation for Economic Co-operation and Development (OECD), the recent economic crisis has shifted debate from innovation for global competitiveness, to consider how to mobilise shrinking resources to best address growing inequality, poverty and unemployment. In emerging economies, there are growing claims that science, technology and innovation-led growth can in fact result in higher levels of poverty and inequality *within* a country.

Thus, while in the recent past the link between innovation and growth was indivisible, recently a new debate has emerged, centred on the connection between innovation and social inclusion. By inclusive development, we mean

... development that reduces poverty, enables all groups to create opportunities, share the benefits of development and participate in decision-making (<http://www.undp.org>).

Indeed, in transitional and developing contexts like those in southern Africa, for many years, universities were challenged to establish a new social compact where they became key agents for inclusive social and economic development. Greater emphasis is accorded to the roles the knowledge work of university academics play in poverty reduction and the ability of all social groups to create opportunities, share the benefits of development and participate in decision-making.

New study on innovation in southern Africa

Such an emphasis drives the focus of the present study, *Universities and Innovation for Inclusive Development (UNIID) Africa*, funded by the International Development Research Centre (IDRC). It seeks to build a stronger African empirical research base in collaboration with partners in four SADC countries – Botswana, Malawi, South Africa and Tanzania – as well as Nigeria and Uganda. The UNIID

Africa project seeks to address the limited attention paid to how universities contribute to innovation for inclusive development, specifically to innovation activities that provide livelihoods to the excluded and disadvantaged.

The project aims to make a conceptual and methodological contribution to research on innovation, development and higher education. It challenges the focus of innovation studies – typically on science and technology, radical innovation and economic development in formal sectors – and extends the remit to encompass innovation that is incremental, takes doing, using, and interacting modes, and is based in informal settings. In turn, the tendency of development studies to focus on top-down development is challenged in favour of inclusive development that focuses on participation by the marginalised as active agents to ensure sustainable benefits.

Linking knowledge generation and the public good with innovation

Similarly, the innovation studies literature is often marked by a conceptual myopia towards the substantive knowledge-generation role of universities and their contribution to the public good. A corresponding myopia exists within the higher education literature, which has insufficient accounts of the role of universities in innovation, technology transfer and diffusion toward economic development. The project seeks to overcome this impasse by linking the knowledge imperatives of universities in relation to the public good and social justice, with those of innovation and technology transfer.

Based on such ambitious conceptual integration, the research aims to conduct empirical research in African universities, in order to make innovation that may be taking place visible; to make the nature of university–community interactions explicit; and to highlight the university as an actor in the innovation system engaging the community. In terms of higher education governance, it addresses issues of accountability to social needs, and promoting scholarship that is more socially and economically responsive to (local) contexts. In terms of the implications for higher education management, the issue is how to create a stronger coherence between research, teaching and community engagement. Finally, the research aims to identify what kinds of incentives will be appropriate as drivers and to address bottlenecks.

Methods and mapping

An interlocking set of research- and policy-oriented activities commenced in October 2012, founded on a survey methodology to map forms of university interaction with the full range of possible social partners in each country – whether firms, farmers, communities, government or social organisations. Such a process will provide an overview of the main kinds of partners, the main types of relationships, channels of interaction, the outcomes and benefits of interaction and the main barriers and blockages across distinct types of institution in each higher education system. The analysis will draw on interviews with senior university management and academics, as well as analysis of institutional documents to understand the governance and management conditions within universities that support diverse patterns of interaction.

The mapping will provide a rich descriptive foundation of existing interactive practice within the universities in a national system of innovation, an empirically contextualised baseline for investigating specific cases of innovation for inclusive development.

We plan a set of comparative case studies in which universities and communities interact to innovate in informal settings to enhance livelihoods. For example, adaptations and diffusion of cellphone technology to inform small-scale farmers' harvest and marketing practices or women market

stallholders' co-operative practices; or exploiting local knowledge of local conditions in collaboration with university knowledge to establish commercially viable enterprises.

Comparing case studies within and across country contexts will provide an evidence base of the facilitators of and constraints on innovative and interactive practice in sectors critical to the informal livelihoods of marginalised communities. Such analysis allows for policies to be informed by insights from the local level and by the priorities of the poor.

Together, the mapping of university practice and the in-depth exploration of innovation in informal settings will allow us to interrogate critically the policy options and interventions typically proposed in the innovation systems literature. The research ultimately aims to inform better targeted policy adaptation and formulation within universities, and in the higher education, science and technology, and economic development communities, to promote inclusive development in each country.

This report presents an exploration in South Africa of universities' roles in innovation in informal settings to enhance community livelihoods, through analysis of case studies in four universities.

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Introduction

South Africa faces significant development challenges. It is characterised as an upper middle-income country (World Bank KAM Index 2012) with medium levels of human development (UNDP 2013), but it has one of the highest GINI coefficients in the world.¹ It is characterised by pockets of capabilities at the global technology frontier: for example, its recent success in winning a bid to host the Square Kilometre Array, a massive global astronomy science and innovation network for which some technologies do not yet exist. At the same time, as the National Development Plan (2012) so eloquently described, a large proportion of the population continues to live in poverty, with little access to water, energy, health services, quality education and livelihood opportunities. An Inclusiveness Index² developed recently by the UNDP found that, relative to other developing countries, South Africa has a very low degree of inclusiveness (Ranieri & Ramos 2013; Ramos et al. 2013). Over the 10 years to 2006, South Africa has become *less* inclusive, suggesting that economic growth has not been accompanied by inclusiveness. Hence, economists and policy-makers increasingly criticise the assumption of ‘trickle down effects’, and instead, argue for a policy approach that foregrounds ‘inclusive growth’.

Indeed, since the formal end of apartheid and the initiation of a democratic dispensation in 1994, government has been attempting to develop policies aimed at promoting inclusive economic growth. The dual goals of enabling global competitiveness of firms for economic growth, and of enhancing the quality of life of all citizens to address inequality and poverty, underpin science and technology policy processes and instruments. These are manifest in a commitment to build a national system of innovation.

The goal of harnessing science and technology to enhance the quality of life of all citizens by addressing poverty and inequality was initially framed in terms of a mission of Technology for Poverty Reduction, in the National Research and Development Strategy (DACST 2002). The assumption was that sustainable development requires that rural and urban communities should have access to innovations that provide more effective solutions to their problems, such as reducing poverty, health, education and agricultural challenges, and increasing energy access. The inclusion of women was identified as a priority, as was the use of indigenous knowledge. An OECD (2007) review of the national system of innovation found that in practice this mission had been neglected in favour of big science, high technology, a focus on firms, growth and the global competitiveness mandate. In this regard, a

1 In 2009, the most recently available figure, the GINI coefficient stood at 63.1; see the United Nations Development Programme Human Development Report , <http://hdr.undp.org/en/content/income-gini-coefficient>

2 The Index used the employment to population ratio as a measure of participation in growth, and the poverty-head-count ratio and the GINI coefficient as measures of benefit sharing of growth.

key focus was policy initiatives to incentivise and support interaction between universities and science councils as knowledge producers, and firms.

Following the OECD review, a new framework of 'social innovation' was defined, to refocus efforts in line with the 'Grand Challenge' of 'Human and Social Dynamics of Innovation'. New initiatives introduced included an attempt to link rurally based universities to interact with impoverished communities to generate livelihoods, particularly by drawing on indigenous knowledge. An Innovation for Poverty Alleviation Programme (2010) focused on promoting sustainable livelihoods, 'through small-scale science and technology-based agro-processing and aquaculture industries' and on 'enhancing human settlements through appropriate technologies for such things as access to clean water, information and communication technologies and renewable energy' as well as support to SMMEs, by providing demonstration technology. Recently, a shift is emerging, to develop a national strategy to work strategically within a framework of Innovation for Inclusive Development, again influenced by OECD (2012a, b, c) and other global and national processes.

These policy developments raise a different set of issues for universities in their interaction with marginalised communities, which have traditionally been addressed through a paradigm of community service or community engagement, rather than the more recent paradigm of innovation and technology development.

It is in this policy context that we began the UNIID Africa research, to explore the basis and evidence for a framework of 'innovation for inclusive development' to guide activity in South African universities. Innovation for inclusive development means that the processes and outcomes of innovation activities should become more inclusive, particularly of those living in poverty and conditions of inequality. Innovation, and the knowledge-generating activities of universities as key actors, should not be the preserve only of firms and the formal sector. Such innovation may relate to solving problems to improve the quality of life of impoverished and marginalised communities, such as the adoption of new solar energy or water purification technologies. Or innovation may relate to enhancing livelihoods in informal settings, whether in urban or rural locations, oriented to resource-based, industrial or service sectors.

In the South African context of a large informal sector,³ high rates of unemployment and the potential significance of links to value chains in the formal sector for local and regional economic development, understanding the dynamics of university involvement in innovation to enhance livelihoods in informal settings is significant. Fourie (2014: 3) for example, proposes that inclusive economic policy solutions must include:

... finding ways to enable those that are excluded from formal sector employment to find (or remain in) sustainable, paid employment or self-employment in the informal sector, and grow their income from such work.

Hence, we chose to focus our empirical investigation on this one specific form of 'innovation for inclusive development', one of many other possibilities. Rather than large or medium or even small-scale firms, we propose that at the centre of analysis should be marginalised individuals and communities in relation to their livelihood activities. They may be organised in co-operatives or social enterprises or micro-enterprises or even individuals co-existing within a community. Just as firms increasingly rely on knowledge producers in universities, public research institutes and other intermediary organisations,

3 The informal sector is estimated to contribute around R157bn, primarily in trade, community and social services, much of it marginal and taking survivalist forms and with little value-add or opportunity to link to the formal sector (Ndabeni & Maharajh 2013).

so too is there a growing sense that the livelihood activities of marginalised communities could benefit from knowledge intensification. The evidence base and the policy instruments by which this can be realised, however, remain undeveloped, and there is not sufficient guidance to inform policy intervention.

We cannot simply assume that such a role for universities will be widely accepted. Universities are driven by their own substantive concerns and long traditions, so that for any external interaction to have value, it should be grounded in and extend academic scholarship, whether teaching or research. The imperative for university–industry linkages since the 1990s has been widely contested, with many South African academics rejecting the potential dangers of private sector capture of knowledge generation and restrictions on science. South African academics may be more likely to support linkages with communities in the interests of the public good, in line with their outreach and community engagement missions. We do not know if this is so, or how it is possible, in distinct types of university. Therefore, the strategic policy question that the study aims to contribute to is:

How do we encourage universities and their academics to extend their scholarship to the benefit of marginalised communities, in research and teaching networks focused on innovation for inclusive development?

This monograph presents empirical research conducted in South African universities, to gather evidence to engage with this strategic issue.

Structure of the monograph

The monograph contributes exploratory research on patterns of interaction in South African universities, with a specific focus on networks of academics and marginalised communities centred on innovation to enhance livelihoods. We describe analytically what exists, in order to begin to account for the effects of university interventions and community activities, and the conditions under which we may promote the role of universities in innovation for inclusive development in terms of realising South Africa's inclusive developmental policy goals.

The monograph begins with a brief review of the emerging literature on innovation for inclusive development, to set out the conceptual and analytical framework adopted for the research. Chapter Two then describes the methodology of the empirical research. Chapter Three analyses patterns of interaction in distinct types of university, to situate the potential for linking university knowledge producers to networks that improve livelihoods of marginalised communities.

Thereafter, Chapters Four to Seven present an in-depth, detailed, 'thick' analysis of each of four case studies, to facilitate comparison. We begin with the interaction between a university of technology and an NGO-led social enterprise, centred on upgrading the capabilities of women in an informal clothing enterprise, structured through a government technology station. A similar case at this university, focused on food technology, is also described briefly. Chapter Five then presents the case of a long-standing project at a research university, to protect the livelihoods of a marginalised fishing community in an environmentally sensitive marine reserve, led by a socially committed academic. Chapter Six analyses a third case based at a rural university, which draws on indigenous forms of social organisation to reintroduce indigenous cattle breeds to improve rural livelihoods, driven by a socially committed academic with the support of government agencies. A second case of a rural science park based at this university is briefly described as a contrast case that is not succeeding. The fourth case,

analysed in Chapter Seven, is a new project based at a comprehensive university to provide innovative solutions for sustainable urban settlements and protect the livelihood of a marginalised community.

Each of the chapters is structured using an analytical template as follows. First, we introduce the case, and tell the story of the interaction as it unfolded over time. We then step back to map the structure of the interaction more systematically, and explain the nature and role of each of the main actors, to inform understanding of their specific roles. We identify and analyse the interface structures that support the interaction or create bottlenecks, within the university and within the community, and explain what the drivers of interaction are for each. We problematise the nature of the innovation, the flow of knowledge and skills and the degree of community participation evident in each case, to expand upon the working definitions of our concepts. A descriptive analysis of the benefits for universities and communities structures an assessment of outcomes and the potential value of the project. Finally, we identify and weigh up enablers and constraints.

Chapter Eight highlights preliminary patterns and insights from the case studies, comparing and identifying the core enablers and constraints of such forms of interaction. Chapter Nine, the conclusion, reflects on the implications for the role of South African universities in inclusive development.

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Building on an Innovation for Inclusive Development agenda

In this chapter, we set out the emerging trend in the innovation systems research literature, to focus on inclusive development and consider how it leads to the extension of a body of work on the nature and role of universities' interaction as knowledge producers with other actors in the national system of innovation, to achieve development goals. We use this as a basis to define working definitions of key concepts to guide our research and to set out analytical distinctions to inform our analysis of the data gathered.

An emerging research literature

While technological and economic development have benefited a minority of the global population, the majority remain in economically fragile and technologically excluded positions (Castells 1998), where their economic activity remains small-scale, informal and largely outside the knowledge flows generated by higher education institutions. Questions are thus raised about innovation that happens outside of formal economic sectors and outside of firms, and whether by using the system of innovation framework, we can identify actors, interaction, knowledge flows and bottlenecks that explain economic and social development. As scholars such as Lorentzen have pointed out, the poor hardly feature in innovation studies (Lorentzen & Mohamed 2010). An emergent trend in the appropriation of the innovation systems literature in developing country contexts is thus 'to redirect part of science, technology and innovation policies from private firms to the civil society, focusing on the poor' (Fressoli et al. 2011: 3).

The term 'innovation for inclusive development' (IID) is but one manifestation of a growing trend to grapple with these issues. A range of related but conceptually different terms such as 'inclusive innovation' (Foster & Heeks 2013a and b), or 'innovation for inclusive growth' (George et al. 2012) are used by international organisations such as the World Bank and the UNDP (Ramos et al. 2013, Ranieri & Ramos 2013). Key research groups have emerged in countries ranging from India, Brazil and Argentina, to the UK and South Africa, as well as cross-country networks such as GRIID¹. Debate centres on the comparative value of concepts and approaches such as 'below the radar' (Chataway et al. 2009), 'bottom of the pyramid' (Prahalad 2006, Peerally & Figueiredo 2012), social technologies (Muller 2010), grassroots innovation (Gupta 2003, Letty et al. 2012), agricultural innovation and technology development for the poor (Hall et al. 2010a and b) and more. The conceptual differences between these terms can be vast. For example, 'below the radar' and 'bottom of the pyramid' innovation approaches focus primarily on the innovation strategies of private sector firms in relation to low-income groups

1 Grassroot Innovations for Inclusive Development network

as potential formal markets, while 'grassroots innovation' approaches focus on how the ideas and traditional knowledge of marginalised people can generate opportunities for livelihoods.

Amidst this terminological confusion, there are growing attempts at conceptual clarification, through developing typologies of approaches (see for example, Fressoli et al. 2011, Gordon et al. 2012, Iizuka 2013). For example, a recent Organisation for Economic Co-operation and Development (OECD) discussion report (OECD 2012a and b) distinguished very simply between three senses used in the range of different approaches: first, the impact of innovation on low- and middle-income groups; second, innovation *for* low- and middle-income groups; and third innovation *by* low- and middle-income groups. (We mention this report specifically, as it has had direct impact on science and technology policy-makers in South Africa.)

All of these approaches have in common that they are experimenting with and exploring the boundaries of innovation system concepts in developing-country contexts. For the Universities and Innovation for Inclusive Development (UNIID) Africa study of which this project is one component, we too are exploring and experimenting, influenced by the research agenda promoted by the International Development Research Centre's (IDRC's) short-lived Innovation for Inclusive Development programme. Santiago defined the assumption underpinning this approach as follows:

Understanding the learning, innovation and competence-building systems in informal settings, along with the pathways to strengthen the links between informal and formal economic activities, could enable innovation in the informal sector to be more sustainable, with wider impacts on productivity, livelihoods and welfare of the marginalised populations (2014: 18).

For this project, we experiment specifically with how the concept of 'innovation for inclusive development' can inform understanding of the university's role in the South African national system of innovation. We adopt working definitions of core concepts to guide systematic empirical research across South African universities, and for the UNIID project as a whole, across countries. This chapter sets out the evolution of our approach.

Setting an IID research agenda

Throughout, our analysis is driven by the main explanatory thrust of innovation systems theory:

Basically, the theory underlying innovation system analysis is about learning processes involving skillful but imperfect rational agents and organisations. It assumes that organisations and agents have a capability to enhance their competence through searching and learning and that they do so in interaction with other agents and that this is reflected in innovation processes and outcomes in the form of innovations and new competences (Lundvall 2010: 331).

Writing to inform the IDRC programme, Cozzens and Sutz² (2014) proposed an ambitious overarching task and research agenda: to bridge the gap between innovation studies and development studies by examining innovation processes in the terrain that is traditionally that of development studies (the livelihoods of marginalised communities in informal settings) and using notions of participation and

2 Cozzens and Sutz (2012) were commissioned to shape a research agenda for the IDRC's Innovation for Inclusive Development programme, based on their own extensive prior work, as well as analysis of emerging trends in the research literature. Unfortunately, before large-scale funding had begun, the programme was closed due to funding cuts instituted by the Canadian government. The UNIID project was the only project funded under the programme, and its contribution can thus only be limited.

agency to further refine the concept of inclusiveness. Natera and Pansera (2013) similarly conclude that interaction between an innovation systems approach and a number of influential development theories can lead to mutual benefit analytically. The broad research agenda has been taken forward by other research groups in various ways, focusing analysis on formal and informal economic activities. Joseph (2014), for example, analyses various forms of inclusion and exclusion evident in the plantation agriculture innovation system in India, arguing for knowledge intensification of labour-intensive sectors that create high employment. Arza & Van Zwanenberg (2014) analyse how different socio-technical systems impact on the potential for innovation that links informal small-scale cotton farmers in Argentina to formal markets and improved livelihood opportunities.

However, given our primary concern with the role of universities in inclusive development processes, we focus on one specific stream of the research agenda: 'to understand how innovation in a given formal setting interacts with other sources of knowledge' (Cozzens & Sutz 2014: 26). Mapping the interaction between these actors is seen as significant to understand innovation processes in informal settings. Our research focus is thus on illuminating the role of universities as knowledge intermediaries that serve to link marginalised communities into wider innovation networks with other actors, whether government, donors or formal sector actors, to generate livelihoods in informal settings. Kraemer-Mbula & Wamae (2010) identify this as an under-researched theme, pointing out that the role of intermediary organisations is well researched in the formal sector, but not in the informal sector.

Extending research on academic interaction

This focus leads us to build on and extend conceptual and empirical work conducted over a period of years, generally aimed to understand the nature and role of university interaction in innovation in developing countries. At each phase of the research, we have built on what preceded, adopting working definitions of concepts and analytical distinctions that appear suitable for illuminating the new empirical focus.

We began with research on university–industry interaction in South Africa (Kruss 2005) and in comparison with countries of the global South, and then extended this to explore university–community engagement in South Africa (Kruss et al. 2012). This work was extended to map interaction with the broader range of social partners appropriate to African contexts, whether government, firms, civil society or community partners, and including marginalised communities (see Kruss et al. 2012, Kruss & Petersen 2009). The work implicitly adopted a broad 'catch-up' approach to development.

We now propose to work more explicitly and systematically, to explore the potential of an innovation for inclusive development approach. This renders a highly focused research scope at the intersection of multiple parameters: a focus on how higher education actors interact with low-income marginalised community actors to link them into networks that generate livelihoods in informal settings.

In the sections that follow, we first set out working concepts of innovation and inclusive development and then we elaborate the conceptual distinctions used to analyse academic interaction.

Innovation, marginalisation and inclusive development

The research agenda Cozzens and Sutz delineated had a direct influence on the framing of our research. Selecting from their conceptual distinctions and the key terms proposed to delineate *inclusive development*, we created working definitions as a starting point to inform our empirical analysis.

Innovation in informal settings

'Innovation' as defined in the innovation studies literature is the development of new products, processes and organisational structures in an economy or society. The level of novelty can be 'new to the world', or it can be 'new to the country' or 'new to the firm'. For our empirical focus, it is largely 'new to the community' or 'new to the informal livelihood setting' in which it is being implemented. Wherever there is technological or organisational upgrading, there is innovation to some extent. Such a process is likely to involve imitation or adaptation of an existing technology to the specific conditions, cultures or values of the marginalised community.

In African and developing country contexts, there is growing use of the distinction that innovation can take two modes: where it is primarily occurring through tacit 'doing-using-and-interacting' modes (DUI modes) or through more formal science and technology modes (STI modes) (Jensen et al. 2007). There is also a growing call that innovation should not simply be defined in terms of 'newness', but also in terms of potential 'value' to users (Marcelle 2014).

Two critical questions this working definition forces us to consider throughout are whether the concept is being stretched too far and losing analytical value, and whether it is appropriate to informal contexts. We will return to these questions after assessing the nature of 'innovation' in specific cases empirically. For analytical purposes, we adopted a simple working definition of innovation as new to the specific community or social enterprise.

'Informal settings' refers to 'a set of places where people live, namely, marginalised households and communities, as well as a set of places where they work, namely, the informal economy' (Cozzens & Sutz 2012: 5). The informal economy is defined as those economic activities that fall outside government regulation, including both the informal sector and informal employment in the formal sector. The formal and informal economic spheres are a continuum and include inter-related activities (De Soto 1989). Marginalised communities and households can earn a living in both spheres. This definition, as set out by Kraemer-Mbula and Wamae (2010) excludes the informal criminal economy from the analysis. The informal economy is an important area of analysis in developing country contexts. Indeed, there is evidence that the informal economy is growing, both in rich and poor countries. It provides between 50% and 75% of employment in developing countries (Chen 2004) and around 18% in developed countries (Schneider 2002).

Analysis of innovation in relation to livelihoods in informal settings also requires a shift in the unit of analysis from the national level to the regional and local levels. Although an interaction between a university and community may be inserted into a broader national innovation system, in most instances the innovation activity is heavily localised. Hence, the key to understanding the nature and direction of innovation activity lies in understanding the local actors in the system and the relationships between these actors, mapping and evaluating channels for knowledge flows at the local level. We therefore substantially broaden the typical innovation actor set to those in the informal sector, small-scale farmers or community co-operatives, as well as other actors such as non-governmental organisations (NGOs), community groups, local government, traditional leaders and indigenous knowledge producers. Significant aspects of relationships include the flow of skills, intellectual property (including indigenous knowledge), knowledge, technology and funding, as well as structures of power and regulation.

The benefits of inclusive development

The concept of 'inclusive development' can be defined in a negative sense – by indicating what it is *not*: It is not 'economic growth alone and economic development alone' (Cozzens & Sutz 2012: 8), nor can it

be equated with ‘catching up’. This is based on a growing consensus that techno-economic growth and equality operate in tension, rather than in tandem (Cassiolato et al. 2003, Dalum et al. 2010, Fajnzylber 1989, Nelson 1977, Pisani 1984). In practice, this means including analysis of the dynamics of problem-solving and knowledge production in informal settings.

Ramos et al. (2013) provide a useful starting point, in drawing the distinction that inclusive growth³ is ‘both an outcome and a process’. That is, all groups should be able to *participate* in the growth process and share the *benefits* equitably: ‘participation without benefit sharing will make growth unjust, and sharing benefits without participation will make it a welfare outcome’ (Ramos et al. 2013: 3 & 4).

Our working concept of ‘inclusive development’ was defined in line with Cozzens and Sutz (2014), and is based on a similar distinction. Inclusive development encompasses outcomes and benefits that are both *by and for* ‘marginalised groups’ – communities and individuals excluded from circles of social and economic power.⁴

The notion that inclusive development is ‘by’ marginalised groups highlights the significance of *agency* as the characteristic that qualifies a process as inclusive development. This stands in contrast with top-down attempts at development that do not involve local communities or include them as active agents in the process, as for example expressed by Sen (1999). Marginalised groups should have input into and participate actively in (ideally) all stages of a collaborative project, including problem identification, idea generation, proposal evaluation, design, fabrication, evaluation and solutions to problems (Gomez-Marquez 2010). Inclusion thus extends to the process by which an innovation is achieved, as well as the problems it addresses and the solutions it provides.

The normative assumption informing our empirical analysis is that individuals in marginalised households and communities should be active agents in all processes of innovation, and not only the beneficiaries of the actions of academic experts. This highlights the need to understand the innovation activities of marginalised communities in the context of their interaction with university academics – how do they produce new products, processes, or socio-technical arrangements that improve their livelihoods?

The notion that inclusive development should be ‘for’ marginalised groups leads to a focus on the distinctive outcomes and *benefits* of innovation in interaction with academics. University–firm interaction is of value when firms link with the university to innovate, learn and build capabilities. The goal is to enhance productivity and competitiveness for the individual firm, for the national sector to access global markets and to strengthen the national system of innovation. Likewise for marginalised communities and their livelihood activities in informal settings, we need to define when interaction with university academics will be of benefit. One useful view is when there is ‘... a multi-stakeholder social learning process, that generates and puts to use new knowledge and which expands the capabilities and opportunities of the poor’ (Berdegué 2005: 15). A benefit of innovation to grow livelihoods is improved *social and environmental value* for the marginalised community. There is widespread evidence of positive development interventions that have been time bound, that last only as long as (donor) funding or programmes and that have not produced social and environmental value for the beneficiaries that is sustainable over time. Equally important when working at the local level, many interventions remain very limited in scale, to a specific group, and are not easily diffused or replicated more widely to other settings. Thus Cozzens and Sutz (2014) stress the significance of scaling

3 The literature around inclusive growth is emerging from the World Bank and UNDP agencies (Ramos et al. 2013 for example). We work with the broader notion of development, given our emphasis on universities as knowledge producers as key actors in innovation.

4 Marginalised groups are prevalent in informal settings, although the two concepts should be distinguished.

up and diffusion for innovation in informal settings, which they see as indivisible from the participatory nature of the process of learning and problem-solving.

We thus define a potential way to assess positive *benefit* from university interaction to enhance livelihoods: innovation that leads to improved social and environmental value for the marginalised community, whereby improved livelihoods are sustained over time, and that can be replicated or diffused more widely to other local settings. However, defining what would constitute such improved value for marginalised communities upfront is not possible, as we lack a research base that provides specific indicators and measures. Hence, we aim to work inductively, to identify the types of benefit found empirically.

Drawing primarily on the work of Cozzens and Sutz, we have set out working definitions of concepts that extend those of traditional innovation studies, to enable us to research innovation in marginalised communities, informal settings for livelihoods and inclusive development as a policy goal. However, we have not set out working definitions of concepts that assist in understanding the specific role of universities as intermediaries linking communities to knowledge structures and other actors, which is the focus of the next section.

University–industry–community interaction

This section outlines working definitions that support a more nuanced analysis of universities' role in innovation processes. These conceptual distinctions are drawn from a framework originally developed for the analysis of university interaction with firms.

Researching flows of knowledge and capabilities

The work of Cohen, Nelson and Walsh (2002) on the links between and impact of universities on firm research and development (R&D) in the United States was influential in shaping a body of research in developing countries. Cohen et al.'s (2002) aim was to identify flows of knowledge and capabilities and the advantages of and constraints on building interactive relationships. Hence, their research instrument emphasised the knowledge fields and economic sectors, the channels and types of relationships, and the outcomes and benefits to firms, of interaction with universities. This approach was first adapted to frame research on the nature of interaction between firms and universities in Brazil (Albuquerque et al. 2008, Rapini et al. 2009). The American survey instrument was adapted to map university–firm interaction across a national system of innovation, to inform policy. It was subsequently adapted to study the nature and patterns of firms' interaction with universities and public research institutes, and universities and public research institutes' interaction with firms, in selected sectors in 12 developing countries in Latin America, Asia and Africa (Adeoti & Odekunle 2010, Arza & Vazquez 2010, Dutrénit et al. 2010, Dutrénit 2010, Eom & Lee 2009, Eun 2009, Fernandes et al. 2010, Intarakumnerd & Schiller 2009, Joseph & Abraham 2009, Orozco & Ruiz 2010, Rasiyah 2009). Types of relationship are strongly related to channels, with the latter being the main means by which knowledge and resources flow and are exchanged between universities and knowledge users. For example, students are a significant channel of interaction in South African universities, but the type of relationship may be a formal contract, or an informal collaboration, or part of a technology transfer relationship.

The approach was further adapted and modified for use in African country contexts, where the concern was that universities were relatively young. For the most part they had a strong teaching focus, did not have a strong science and technology research base and, in general, had low levels of research activity. Items were thus added to the instrument to determine the existence of interaction in general,

with a wider range of partners than firms, including small-scale farmers, communities, individuals and households. In addition, items were added to reflect the teaching focus more strongly and not only research activity, as well as more tacit and less formal forms of interaction (Kruss & Petersen 2009).

A final iteration again adapted this instrument slightly for use in South African universities, to assess forms of interaction with a range of possible actors (Kruss et al. 2012). Here, academics were asked to assess the extent and ways in which they 'extend their academic scholarship to the benefit of external partners'. 'Outputs' were defined as measurable and codified results of interaction, while 'outcomes' were more difficult to measure, relating to wider impact, often appearing after some time and being primarily tacit and subjective. The benefits of interaction included measures of both outputs and outcomes.

We have thus developed concepts and methods to map patterns of interaction across a national innovation system in terms of the types of relationship, the channels of interaction, the outputs, outcomes and benefits of interaction, and the perceived constraints on interaction. The present study uses the final survey instrument as developed through these consecutive research phases in order to map patterns of interaction in South African universities, described in Chapter Three.

Drivers, forms of interaction and participation

We also use conceptual distinctions of the drivers, forms of interaction and benefits to analyse the knowledge flows and types of relationship evident in the case studies, described in Chapters Four to Seven.

The Latin American research developed an approach to link forms of interaction with the associated benefits and risks for firm and university actors, in developing country contexts (Arza 2010, Dutrénit & Arza 2010). This approach drew on and developed a South African matrix of types of interaction (Kruss 2005) and tested it through econometric analyses of data from a survey of firms and universities in each of four Latin American countries (Arza 2010, Dutrénit & Arza 2010, Fuentes & Dutrénit 2013).

Using these concepts, we interpret the higher education 'drivers of interaction' with firms in terms of the balance of intellectual and financial imperatives motivating individual academics and institutions. In turn, these shape distinct forms of interaction with different benefits for universities and for firms. Following Arza (2010), we distinguish firm strategies as either passive or proactive. Passive strategies mean that firms are driven to interact with universities to meet short-term financial objectives, to enhance production and efficient operation – that is, driven more strongly by financial imperatives. Proactive strategies mean that firms are driven to exploit university knowledge resources proactively in their innovation activities, to address long-term objectives and, hence, are driven more strongly by intellectual imperatives (Arza 2010).

Forms of interaction can be classified into four broad types, distinguished by the combinations of goals that motivate firms (passive or proactive innovation strategies) and universities (financial or intellectual strategies) to interact. Interaction motivated by the economic strategies of universities and passive strategies of firms is more likely to take the form of 'service', whether scientific or technological, where knowledge flows mainly from the university to the firm. Examples are consultancy or testing or quality control. In contrast, interactions motivated by the intellectual strategies of the university and proactive strategies of firms are more likely to take 'bi-directional' forms, where knowledge flows are two-way and there is a high potential for joint learning. Examples are joint R&D projects or networks. 'Traditional' forms of interaction are driven by the intellectual imperatives of the university and the passive strategies of firms, with knowledge flows to firms but defined strongly by academic functions,

such as hiring graduates, conferences and publications. They may also take the form of financial flows from firms to support the academic function, such as endowments of facilities or chairs or scholarships. These channels are indirect, in that they are available freely in the public realm, and do not require a personal exchange. Finally, 'commercial' forms of interaction are driven by the economic strategies of universities and the proactive strategies of firms, taking the form of spin-off companies or incubators that, like the bi-directional channels, require direct personal interaction at critical stages.

Passive strategies are more likely to lead to uni-directional, dyadic (two-actor) interactions, with benefits limited to the specific firm, and few benefits for the university or for the sector and development goals. Proactive strategies often lead to bi-directional and multiple stakeholder networks, collaborative partnerships, with benefits extending more widely across a sector and building a national system of innovation.

We postulate that individuals and communities in informal settings likewise may be driven to interact with universities driven by passive or proactive strategies. Communities typically wish to resolve immediate and short-term problems, and these often relate to a lack of resources and entrepreneurial expertise, or require low-level technology solutions. Knowledge flows in such instances are typically uni-directional, from academic experts to marginalised communities. Such interactions typically take the form of expert advice, extension services or consultancy services. Traditionally, university 'outreach' forms of interaction with communities may not involve knowledge exchange at all, but may be based on financial or other forms of material and human support or donations. These forms of interaction are more likely to be driven by philanthropic or charitable social imperatives. Such passive strategies do not typically require the kinds of knowledge and technology with which university academics are concerned, or they do not allow reward or provide incentives that academics value, such as publications. Some academics in universities claim that such a role should be fulfilled by community organisations or government, and not the university.

However, communities do have proactive strategies in which they may enter into partnerships with academics to develop capabilities, conduct research to articulate and translate development needs, or collaborate on participatory and action research projects that can inform livelihood and development needs in the medium to longer term. Knowledge flows in such instances are more likely to be bi-directional. The interaction is typically more formally structured and takes the form of collaborations, or various forms of participatory networks. These forms of interaction more typically encompass participation and agency on the part of marginalised communities.

Addressing communities' passive strategies may of course be one part or a phase of a long-term collaboration with an academic or research team, typically as a way to initiate relationships. And where there has been collaboration with a community over time, there is likely to be a mix of forms of interaction evident.

These forms of interaction have distinctive outcomes and benefits for the community and for the university and, in addition, are associated with social benefits for knowledge production and diffusion in the national system of innovation (Nelson 2004). For example, uni-directional interaction in the form of expert consultants that offer packaged solutions may create dependency and invoke a sense of passivity and entitlement, weakening the capacity of a community to organise its own livelihoods, or to add social and environmental value in a sustained way. Marginalised communities are more likely to effect agency in bi-directional forms of interaction such as a participatory research network, which can yield more effective and sustainable social and environmental value.

Organisational arrangements and interface structures

Our research on university–firm interaction and on university–community engagement also provided the basis to investigate organisational policies, interface structures and mechanisms *within* universities that support and promote interaction with other actors. These concepts are of particular use to address the strategic question of the present research – how universities have and can build the capabilities to support interaction with marginalised communities.

Individual universities are challenged to change their missions, policies, structures and incentive mechanisms to develop the capacity to promote, support and manage interaction with firms, and a vast literature has emerged on the best ways to do this. The challenge is even greater, when interacting with marginalised communities, given major knowledge and power imbalances. There is a higher education literature that focuses on the structures and mechanisms required to facilitate interaction with social partners more effectively (De Wit 2010, Jongbloed, et al. 2008, Roxă et al. 2010, Vakkuri 2004). A key contribution is that universities need to become more ‘entrepreneurial’, in the literal sense of ‘enterprising’ – a university that is able to continually ‘find new ways to proceed that can be mixed with traditional procedures’ (Clark 2008: 456). The ability to respond to change and be flexible and adaptive in how it organises is critical to a university’s role in innovation. Clark (1998, 2004) suggests a framework of five elements by which universities can develop the necessary strategic capabilities to respond to the multiple new demands of government, industry and social groups, while maintaining their traditional roles as knowledge-based institutions. They need a diversified funding base (a spread of different sources of support), a strengthened steering core (from central management to faculty and departmental levels), an expanded outreach periphery (the units and centres that typically move across boundaries to bring in external partners), a stimulated academic heartland (that is, strong academic departments that are committed to change) and an integrated entrepreneurial culture (an institutional culture that is shared widely). Including such analysis of the policies, institutional culture and organisational structures of a university is a critical part of our approach to understanding the university’s interaction with marginalised communities.

Martin’s (2000) study of institutional practices typically established to manage interaction with firms in developing countries provides a useful distinction between ‘internal’ and ‘external interface structures’ that we use to identify structures oriented to communities. Internal interface structures are dedicated forms of organisational development created within a university to support interaction. These may take a range of forms such as dedicated managerial posts, a dedicated office to promote innovation, engagement or research, technology stations, contracts offices, IP offices or centres for continuing education. External interface structures play a similar role but they typically have a separate legal status, to enhance flexibility and responsiveness, and to create a more professional interface. These may include incubators, science and agricultural parks, or university-owned companies. There has been a high degree of experimentation with these forms of interface structure, shaped by a university’s location, research strengths and academic culture (Kruss 2005).

For the present research, we also explore empirically the ways in which marginalised community actors are organised to facilitate participation and networks, identifying whether they create any internal or external interface structures, and what forms these take.

Strategic considerations: enablers and constraints

We use these concepts to map the complex patterns of interaction with community, firm, government and other social actors in universities across the national system of innovation, identifying the organisational conditions that facilitate and constrain these patterns.

We use the definitions of innovation for inclusive development to identify potential case studies in informal settings with marginalised communities, within these same universities, and to analyse the cases systematically. We analyse the actors in the network, the nature of innovation, the forms of interaction, the extent of participation of marginalised communities and the benefits of interaction, to determine how well they exemplify this ideal type. We investigate the policy context, the university organisational policies, structures and mechanisms and the organisational arrangements of the communities, to identify the conditions that enable and constrain interaction. Finally, we return to consider how the evidence can inform our understanding of the role of South African universities in inclusive development and how academics can link with marginalised communities on a wider scale and to greater benefit.

A multiple case study methodology

The contribution of the research is to use richly descriptive case studies to analyse activities of universities interacting with marginalised communities. Given the exploratory nature of the research, qualitative and open-ended methods are more appropriate. We propose comparison of multiple cases conducted using the same methodology and analysis using the same set of conceptual distinctions. On this basis, we can begin to inform understanding of the effects of university interventions and community activities, and the conditions under which we may promote innovation for inclusive development.

A mapping study (completed in South Africa in 2012) provided a breadth of perspective, providing an outline of the typical patterns of interaction at different types of university, with the full range of actors, in the context of policy and the national innovation system (see Kruss et al. 2012). The design entailed case studies of a set of universities selected to represent distinctive types in the national system of innovation, together with a survey of the interactive practices of individual academics at each university. These case studies analysed the scale and patterns of interaction in relation to the institutional policy, structures and mechanisms in each university.

Such analysis contextualises the scale and nature of interactive activity across the South African national system of innovation, providing a sense of distinctive patterns of partners, interaction and benefits in different types of university. Chapter Three provides a summary of the main patterns and trends identified, to situate the present research.

The set of new empirical case studies focuses on one very specific form of interaction: the role of the university as an intermediary knowledge partner within networks of knowledge producers and users located within localised systems of innovation. The emphasis is on the role of the university as an enabler of a specific innovation that has benefitted livelihoods in the communities in which they operate. The research question is thus:

What facilitates and/or constrains interactions between universities and marginalised communities that promote innovation to enable livelihoods in informal settings and support inclusive development?

Identifying cases of interaction

The case study design depended on identifying existing cases of academics' interaction with marginalised communities. We need to stress upfront that such cases of interaction are not common in South African universities. In fact, they are quite rare. An extensive search was required to find suitable cases for empirical study.

The purposive selection of case studies was confined to of the four universities in which we mapped patterns of interaction: one research university, one comprehensive university, one university of technology and one rural university.⁵

Information about each potential case was mapped against a matrix of selection criteria (Box 2.1). That is, the case needed to display evidence, even if complex or tenuous, of innovation within the context of university–community interaction, inclusive development, an informal setting and an orientation towards improving livelihoods. This was in contrast to an orientation towards improving the quality of life (through water or energy, for example) or other orientations such as health that may promote inclusive development. Ideally, both the process and the outcomes of the interaction were inclusive of the voices and needs of marginalised groups.

BOX 2.1 *Selection criteria for cases*

- Does the interaction contribute towards improved livelihoods?
 - Is the case set in the informal economy or within informal employment in the formal economy?
 - Do local communities participate in the identification of the problem that the interaction is seeking to solve?
 - Can these communities be characterised as marginalised?
 - Are products, processes or organisational structures developed?
 - Do local communities provide input into possible solutions?
 - Do local communities participate in processes, including proposal evaluation, setting the terms of engagement, and monitoring and evaluation?
 - Do local communities contribute their knowledge in a collaborative process of knowledge production?
-

We began with a list of possible cases identified during the mapping process. Each academic surveyed had been asked to describe their 'best' interactive activity, producing a list of potential cases. This data provided a starting point for the search, but did not yield significant leads, except two potential cases at the rural university. Bear in mind that there were 442 academics surveyed at the research university, 343 at the comprehensive university and 462 at the university of technology.

Researchers then accessed other opportunities at their disposal. For example, existing networks and knowledge partners based at the universities or in their surrounding communities were tapped to find possible cases. The university of technology academics reported activities based at their technology stations in the survey. We successfully visited and interviewed the directors and identified two potential cases.

⁵ The 2012 study included a second research university, but for symmetry and ease of analysis we included only one instance of each type of university in this study.

Other sources of purposive data gathering included online searches of university websites, as two universities⁶ had databases of cases of community engagement. So, for example, the research university had a kind of 'match-making' database on which community partners could request research and teaching support from the university, and academics or students were invited to take up opportunities. The database had listed 152 projects between inception in 2010 and July 2014. A few examples selected at random illustrate that typically requests related to quality of life issues, rather than livelihood issues:

- Explore what it means for those who undergo treatment for XDR-TB, in connection with HIV, to look forward to 'going home once I am cured'.
- Research into new material and design for a pre-school fence that doesn't get stolen, can't hurt children and does not limit visibility.
- Research on exit strategies for street workers as well as documenting and identifying support strategies for the self-help groups.
- Internship in the City of Cape Town to explore opportunities for entrepreneurs.

These database sources did not lead to the identification of any of our cases.

Where the university hosted a community engagement office, this was a good starting point to identify possibilities. Consultation with the director led to the identification of potential cases at the comprehensive university. Some community engagement offices produced annual publications showcasing good practice, which was how we finally identified cases at the research university.

When the information gained in this manner indicated that a particular interaction could be suitable as a case study, a preliminary interview with the key academic involved was initiated. This served to confirm whether the engagement met the criteria, while at the same time establish a relationship with the academic and set the groundwork for further interviews. Some cases were abandoned after such an initial interview and the purposive search process resumed until a case that met the criteria to a stronger degree was found.

Eight cases that could meet all of these criteria to some degree were thus purposively selected, although each displayed features of some of the criteria to a greater extent than others, summarised in Table 2.1.

Case study design and fieldwork

The case study design was simple: semi-structured interviews with actors in the network, supplemented by background research and documentary analysis that included relevant policies and information about each actor and the outcomes of their interaction. Fieldwork followed a purposive and snowball methodology to schedule and carry out interviews with academics, community leaders and community participants.

Once suitable case studies had been identified, more extensive background research was conducted prior to fieldwork in order to maximise the effectiveness of the interviews. Since this study is exploratory and is venturing into new empirical and theoretical territory, the interaction that is the focus of the investigation was often located within new, unusual, or unexpected contexts. It was thus particularly important to be well prepared. Sources of background information included:

6 The comprehensive university had a portal on which students and academics could showcase their work, a kind of electronic bulletin board to 'advertise' what they could offer to communities and potential employers.

- Government policies related to the focal problem of the case
- A search through the web presence (if any) of the interaction
- Background information about each of the partners in the interaction, including the community, the university and any other known partners. In contexts where local actors and activities did not have a significant online presence, meetings and telephonic contact were a key source of information.

The anchor for scheduling interviews and site visits was the core academic involved in the project, who was well positioned to facilitate access to interview other academics, students, community leaders, community participants and other partners. Scheduling followed a snowball process that ran concurrently with fieldwork interviews and site visits. Interviews with community leaders and community participants were conducted 'on site', at the location where the activities of the partnership are implemented. Site visits allowed researchers to visually inspect the location and activities of the partnership and relate these observations to the testimony of the interviewees. Valuable contextual information could be gained from site visits, for example information about housing (formal or informal), local economic activity, levels of development, the condition of the natural environment or the level of poverty.

Interviews as the core methodology

Interviews were semi-structured, following dimensions specified in the analytical framework, and were on average an hour in duration. Each interview was conducted according to the ethics procedures of the Human Sciences Research Council, as approved by the Research Ethics Committee. For all interviews, a signed consent form and confidentiality agreement was retained. Each formal interview was digitally recorded in an audio format and later transcribed into a text format for use in analysis.

The interview took a narrative approach, meaning that it first took the form of a story or history. A narrative approach was seen as the best way to capture all the required information in a way that made sense to both the interviewer and the interviewee. Thus, in each interview the interviewee told the story of the engagement, from its origins to its current state. Along the way the conceptually informed questions were used as entry points to systematise the underlying story.

Interview methods and instruments were customised for academics, community leaders, community participants and other social partners. Community leaders typically play strategic, administrative and networking roles, and act as liaison between communities and universities. On the other hand, community participants not in leadership positions tend to play more passive roles and have lower levels of skill and social capital. Interviewing community participants was an important part of learning about the 'nuts and bolts' of the interaction. They were also significant to gathering the information required to assess the outputs, outcomes and real-world benefit of the interaction – looking at how the interaction has added value to the daily lives and livelihoods of community members. For instance, information about the fishing community described in Chapter Five was collected through a site visit and two interviews, one with the head of the local organising committee and another with the full set of committee members. This was supplemented by background details available in Sowman (2009), Sowman et al. (1997) and Sowman and Wynberg (2013).

In parallel, interviews were scheduled at some universities with project managers, administrators and community engagement offices. For the eight potential case studies, there were a total of 20 interviews conducted, some of these relevant to more than one case (see Table 2.1). The minimum requirement for each case was an interview with the central academic and the leader of the social partner organisation.

The case study analysis

Short summaries of all eight potential cases are included in Table 2.1 for illustrative purposes. In the chapters that follow, we focus only on the most suitable case at each university, that which allowed for the most in-depth analysis and comparison (bold in Table 2.1). Short descriptions of a second case, for the purpose of contrast, were also included in Chapters Four and Six (bold and italics).

TABLE 2.1 *Fieldwork interviews*

University	Social partner	Interviewee(s)
University of technology (Western Cape)	Soya co-operatives	Academics from a food technology station Leader of the SMME Leader of a service learning unit
University of technology (Western Cape)	Women's sewing collective	Academic from a clothing and textile technology station Leader of women's sewing collective Community participants Leader of a service learning unit
Research university (Western Cape)	Fishing community	Academic from an environmental research centre Community leader Local organising committee
Research university (Western Cape)	Stove design for street vendors	Academic from an energy research centre
Rural university (Eastern Cape)	Indigenous cattle co-operatives <i>Agricultural park</i>	Academic from a department of agriculture Project administrator Student and interns Project manager Community representatives
<i>Comprehensive university</i> (Eastern Cape)	ICT Hub	Academic from an ICT department Staff from the social partner
Comprehensive university (Eastern Cape)	Informal settlements	Academics Community leaders Community participants

The analytical focus is on identifying the conditions under which interaction between university and community improves livelihoods, or not, as the case may be. In each of Chapters Four to Seven, we provide an analytical description of the cases, structured according to the same logic, to aid comparison:

- The main **livelihood problem** of the marginalised group that is addressed by the interaction
- **Mapping the structure** of the interaction
- Problematising the **drivers** of interaction for each of the actors
- The **nature of innovation** involved in addressing the livelihood problem through interaction
- The organisational arrangements and the **interface structures** of each actor that supports/ constrains their capacity to interact, and in an inclusive manner
- The flow of **knowledge and skills** through the interaction, including aspects of knowledge intensification, skills transfer, technology diffusion, training and capacity development
- The nature and extent of **community participation**
- The **outcomes and benefits** of interaction for the university and for the livelihoods of marginalised groups
- Finally, an analysis of the **enablers and constraints** of the interaction.

In Chapter Eight, we first compare the relative 'achievements' of the case of interaction, by analysing the way in which innovation by and for marginalised communities is promoted. This is assessed by comparing the nature and extent of participation, particularly the flow of knowledge and skills, and by comparing the outcomes and benefits for the community. We then consider the enablers and constraints of such 'achievements' in terms of the drivers of interaction for each set of actors and the organisational arrangements and interface structures that support their capacity to interact. Finally, we return to consider critically the nature of innovation in informal settings, and the role of the university.

The South African higher education context

Our work mapping patterns of interaction across the higher education system in South Africa (Kruss et al. 2012) provides insight into the universities' roles in the national system of innovation. This chapter serves to situate the empirical case studies within the context of the orientation, capabilities and practices of the four universities, and the higher education system.

The contours of the higher education system

South African universities have a degree of autonomy prescribed by the Higher Education Act (No. 101 of 1997), which enables them to appoint university councils and executive management. They derive their revenue from three streams: government subsidies, student fees and research grants from government agencies or private donors, domestic and international. Government funding is used to maintain infrastructure, and to put systems in place for teaching and learning and research activity.

After a process of institutional mergers and restructuring from 2004 on, the higher education system consists of 23 public universities: 11 research universities, 6 universities of technology and 6 comprehensive universities. The research universities offer formative and professional bachelor's degrees, diplomas and certificates at undergraduate level while universities of technology offer undergraduate diplomas that are vocationally orientated as well as bachelor of technology degrees. Comprehensive universities offer a mixture of the programmes of traditional universities and universities of technology. Rurally based universities were created as ethnically based teaching universities in the apartheid bantustans and were historically disadvantaged in terms of resources and facilities. They have self-defined as a group with distinct needs and roles. Table 3.1 provides a list of universities with indicators of their size, R&D expenditure and enrolment patterns, and illustrates the significant differences between these four institutional types. Based on our recognition of the substantive nature of higher education, and our recognition that interaction 'is ineluctably contextual, and historically specific' (Muller 2010: 85), we selected universities to represent these four main institutional types.

TABLE 3.1 Higher education overview (2008/09)

<i>Universities</i>	<i>Total R&D expenditure (R000)</i>	<i>Researcher headcount</i>	<i>Postgrad. headcount</i>	<i>Undergrad. headcount</i>
<i>Research universities</i>				
University of Cape Town	698 000	2 321	1 467	15 800
University of the Witwatersrand	616 702	1 754	1 131	16 845
University of KwaZulu-Natal	554 273	1 871	1 168	24 897
University of Pretoria	551 344	1 993	1 563	28 450
University of Stellenbosch	401 557	1 043	986	15 869
North-West University	226 185	1 298	79	43 596
University of the Free State	180 874	109	587	15 970
Rhodes University	99 897	291	256	5 456
University of the Western Cape	132 972	516	364	11 836
University of South Africa (distance)	146 730	1 051	778	203 115
<i>Comprehensive universities^a</i>				
University of Johannesburg	128 455	689	622	35 569
Nelson Mandela Metropolitan University	84 510	437	356	19 768
<i>Universities of technology</i>				
Central University of Technology	31 174	119	68	8 458
Tshwane University of Technology	89 298	455	157	48 168
Durban University of Technology	55 076	299	60	22 322
Cape Peninsula University of Technology	52 321	275	106	27 691
Vaal University of Technology	19 113	190	29	13 239
Mangosuthu Technikon	4 526	32	0	10 096
<i>Rurally based universities</i>				
University of Limpopo (comprehensive)	32 193	413	136	14 395
Walter Sisulu University (comprehensive)	31 941	526		23 411
University of Zululand (comprehensive)	21 779	231	151	6 456
University of Fort Hare (research)	10 157	69	155	7 420
University of Venda (comprehensive)	8 931	278	49	10 124
Total	4 191 366	16 313	10 998	628 951

Source: DST 2010

Note: a) See four comprehensives under rurally based group.

Policy changes and the role of universities in economic development

Changes in the policy framework governing academic engagement impacted on how universities interact with firms, communities and other actors.

The White Paper on Science and Technology (DACST 1996) identified strategic alliances, networks, partnerships and collaboration between universities and industry as a primary means to reposition higher education to play a new role in economic development. Over the following years, the Department of Science and Technology (DST) established funding and incentive mechanisms and new institutions – such as government and industry research co-funding programmes, innovation incentivisation funding programmes, sectoral incubators and technology platforms – to drive university–industry interaction aimed to address the technology achievement problems evident in South Africa. The US paradigm was a strong influence, evident in new policy mechanisms to promote technology transfer, commercialisation and incubation in the high technology fields of biotechnology, nanotechnology and ICT. A number of national conferences and symposia were held to facilitate and promote university–industry interaction, and a national organisation was established to develop expertise in research and innovation management.

The response of higher education institutions and academics was diverse, depending on their historical trajectories and research capabilities, particularly in the key disciplinary fields of science, technology and engineering (Kruss 2005, 2006). Most universities engaged with these national policy imperatives to inform their strategic and research policies, and established formal interface structures such as contracts offices, technology transfer offices or university-owned umbrella enterprises, to promote innovation and firm interaction that articulated with their research structures in some way (Kruss 2005). A few adopted the model of an ‘entrepreneurial university’ and proposed strategies to commercialise their intellectual property as a source of ‘third stream’ income, such as spin-off firms (Kruss 2008). Financial imperatives – given significant cuts and redirection of priorities in research funding nationally from the late 1990s – drove a large proportion of academics in science, engineering and technology fields to pursue consultancies and contracts with firms.

New legislation, influenced by the US Bayh-Doyle Act, was introduced in 2008 to promote the utilisation and commercialisation of intellectual property developed from publicly funded research to social and economic benefit. A centralised coordination structure, the Technology and Innovation Agency, was established to stimulate and intensify technological innovation. Hence, there is increased pressure on universities to exploit viable knowledge and technology developed through academic research, and a renewed emphasis on the development of technology transfer offices at all universities.

Some universities and many individual academics actively resisted interaction with industry, viewing it as ‘inimical to traditional academic work’ and a potential threat to their scientific credibility and integrity, and to future knowledge generation. There was opposition to the ‘innovation’ agenda, which was seen to be informed by a narrow instrumentalist model of the university (Lange 2003, CHE 2003). An alternative discourse of ‘engagement’ and responsiveness took root, with debate around the purpose, the partners and the nature of engagement, in line with the transformation agenda of the White Paper on Higher Education (DoE 1997), that universities should demonstrate ‘their commitment to the common good by making available expertise and infrastructure for community service programmes’.

A process of institutional audits mandated from 2005 by the Higher Education Quality Council prompted stronger formal commitment to ‘community engagement’ alongside the missions of teaching and research, and provided an impetus for processes of institutional change to formalise ‘community engagement’ in the policy, structures and mechanisms of all universities. These have permeated into the practices of academics in varying ways and to varying degrees, across the higher education system.

Mapping patterns of interaction

We conducted a survey of individual academics in each university, to determine whether, in what ways and with what outcomes they interact with other actors in the national system of innovation. A high average response rate of 62% was achieved, meaning that the scale and contours mapped can be determined with a high degree of reliability.

The scale of interaction reported across the universities reflects awareness of the significance of ‘academic engagement’. A high 81% of academics viewed ‘engagement’ as relevant to their academic role – at least, in some way and to some extent. At each university, there were groups of academics who did not interact at all. More importantly, we found groups that engaged with varying degrees of frequency (on an isolated to a moderate scale), and with varying degrees of ‘networkedness’ (with a single or multiple partners). The relative size and combination of these groups was distinct in each university. Table 3.2 summarises the proportion of academics in each group per university. On this basis, we could identify universities with a greater or smaller proportion of actively engaged and networked academics.

TABLE 3.2 Comparing the scale of interaction across the four universities

	Research university	Comprehensive university	Rural university	University of technology
No engagement	7%	21%	14%	26%
On an isolated scale	38%	38%	40%	17%
On a moderate scale with a single partner	33%	23%	24%	21%
On a moderate scale with more than two partners	23%	18%	22%	37%
Number of academics in sample	442	343	274	462
Total number of academics in institution	716	563	290	722

However, these percentages told only part of the story. If 93% of academics at a research university report that they engage with external partners, what does this mean in practice? The more complicated step was to analyse the patterns of interaction – the partners, types of relationship, channels of interaction, outputs and outcomes – at each university. We identified complex – and messy – combinations of types of relationship with distinct forms of partners. Here we provide an analysis of the main patterns, based on the predominant trends of more active and frequent interaction at each university, bearing in mind that these mask significant differences between distinctive knowledge fields within each university and, also, may mask significant but small niche areas of activity. The concentrations of these groups differed by knowledge field and faculty, and pockets of ‘good practice’ were evident in a wide range of fields.

A socially responsive, research- and teaching-oriented pattern

Interaction at the research university was shaped by the strong institutional promotion of a policy of ‘social responsiveness’, the public good and development. The strategy to promote social responsiveness was devolved to individual faculties and departments, in acknowledgement of the dominant institutional culture that prized academic freedom and the reputational priorities of academics. Individual academics, often those with a strong social conscience and commitment to

equality and development, acted as champions driving a social responsiveness agenda in their faculties. The university had internal and external interface structures to promote research and innovation, and a dedicated unit to promote social responsiveness, but these were not integrated and operated on parallel tracks. A brokerage approach meant that a number of creative mechanisms were used to enlist support from academics, such as open days, awards, publications and websites.

A widespread acceptance of 'social responsiveness', at least in principle, was evident in the small number of academics who reported they did not engage (7%). For most academics, however, this had not changed their practice very much, and an attitude of 'we have always done it' tended to prevail. A sizable group of academics interacted more frequently, but for many of these, this was in isolated instances (38%), or on a moderate scale with only one external partner (33%). When we investigated further, the most common partner was other academics, and these academics were typically involved in research relationships through informal and tacit channels of collaboration, with primarily academic benefits. Interviews also revealed a tendency to include professional academic activities (such as serving on editorial boards or professional associations) under the rubric of 'social responsiveness'. This suggests that a very narrow conception of interaction that extends traditional academic roles in a very limited manner was prevalent.

A smaller group of academics interacted actively in networks with multiple external social partners (23%). This interaction was integrated into their research and teaching relationships and, through more direct and knowledge-intensive channels, with community- and firm-related benefits as well. Socially responsive teaching relationships were an emergent trend. This is the group amongst which we are likely to find academics involved in innovation and engaging with firms and marginalised communities.

In this university *responsive research- and teaching-oriented activity* tended to stand out as the main pattern for less than a quarter of academics, while the majority acknowledged the value of interaction, but did not actively engage with firms or communities.

A teaching-oriented community and research-oriented firm interaction pattern

The comprehensive university faced a strategic challenge to create a new type of academic institution and build its academic reputation. In addition, it was challenged to develop new institutional policies and structures following the process of higher education mergers. The resulting institutional policy vacuum meant that a policy of 'community engagement' was driven in a decentralised and diverse way by deans of faculties. A key role was also played by heads of development or research or technology-transfer 'entities', units funded by external donors or clients, that some have defined as 'boundary spanning', as they are not inserted in formal structures of university governance and funding. Here, too, individual champions played a key role, on the base of a long-standing commitment to engagement with regional development in a region with high levels of poverty and unemployment. Interface structures to promote innovation and technology transfer were strong, inherited from the technikon that merged into the new comprehensive university, but operated in isolation from community-engagement activities. In general, there was a strong institutional focus on the local and regional levels, rather than the national or international levels.

The pattern was thus of a group of academics who did not interact at all because they did not perceive engagement as part of their academic identity, or because of resource constraints, concentrated in specific fields (just over a fifth of all academics)⁷. A large group of academics had a generalised commitment to engagement but had not changed their practice significantly (38% in isolated

7 This was determined through principal component analysis of the responses of those who indicated they do not interact, to a set of reasons.

instances only). A group of academics engaged frequently (23%), and our analysis shows that this group interacted most commonly with communities, then firms and then other academics. A small group were involved in networks in a limited range of knowledge fields (18%). Teaching and learning-oriented types of relationship with communities were evident in the predominance of student learning and alternative teaching types of relationship, and indirect channels of interaction. These are new forms of service learning and older forms of workplace learning. Thus, two distinct clusters of active interaction stand out at this university – community partners associated with *teaching-oriented interaction*, and firm and academic partners associated with *research-oriented interaction*.

A development-oriented service pattern

A more active development-orientation was evident at the rural university, in line with its institutional mission, shaped by its historical location in an impoverished rural region and its strong political but relatively weak research reputation, having been established as a teaching institution. Historically, interaction had been catalysed by academic champions directly reporting to senior institutional leadership. Mergers meant that here too, the university was grappling with the implications of incorporating an urban campus.

The most actively engaged academics tended to be those based in 'boundary spanning' centres and institutes reporting directly to the vice chancellor, not well inserted into formal institutional structures. Consensus was that a recent shift to formalise 'community engagement' was positive and would lead to a more coordinated and effective practice, based on expertise that had been hard won over the past decades.

The pattern here, too, was of passive awareness of community engagement on the part of many academics – 86% indicated they interact in some way, but a high 40% interact only in isolated instances. There were two similar-sized groups of academics that actively interacted with a single partner (24%), or networked with multiple partners (22%). The academics that interacted actively did so primarily with other academics, but with community and rural partners almost equally significant. The forms of interaction were distinctly development oriented, at the local and regional level, with service types of relationship and direct channels of interaction with these partners prevalent. Outputs were similar to the other universities, primarily academic, but the outcomes and benefits reported were more strongly local development and community oriented. A *development-oriented service pattern* thus prevailed at this university.

A firm and user teaching- and research-oriented pattern

Interaction at the university of technology reflected its distinctive strategic focus on technology and workplace learning, and its battle to forge a new identity and build a distinctive academic reputation. The institutional framework that aimed to promote 'community engagement' was defined primarily in relation to teaching and learning, in terms of work-integrated learning and service learning, requiring a paradigm shift on the part of many academics. Again, policy and structure to promote innovation and technology transfer focused primarily on firms, but significantly, on small, medium and micro-enterprises (SMMEs) with informal sector firms seen as a priority.

Many academics did not see themselves as extending their knowledge to the benefit of external actors at all (26%), for a range of reasons related to institutional constraints and academic identity. A small group interacted in a very limited way, in isolated instances (17%). A larger group tended to interact quite frequently and quite intensely with multiple partners (37%), the largest proportion of all four universities. Partners were primarily firm and government, and then, community development actors.

Education of responsive students and work-integrated learning were the most frequently reported type of relationship, but analysis showed that these had low importance for academics. Community-based research, customised training and various firm-oriented types of relationship were more important, and the channels of interaction tended to be tacit, more strongly related to technology transfer or more user-oriented than related to community-based interaction. A range of benefits and outcomes of interaction resulted, primarily to the benefit of academics, but also more significant for firms than for other social partners. A *firm- and user-oriented teaching and research pattern* tended to prevail at this university.

Contextualising the potential for innovation-oriented to inclusive development

There are clear differences between the universities that, for the most part, are consistent with the strategic challenges faced by distinct institutional types, intersecting with the historical trajectories, institutional cultures and regional location of specific universities.

The general awareness of the need to contribute to economic and social development, and the commitment to interaction on the part of most South African academics is incontrovertible. However, conceptual confusion and contestation within and between universities as to what this means for academic practice, and what forms it should take, is evident. Core academic activities are often reported as engaged activities, and engaged activities are resisted as not central to academic identity. A large number of academics who do interact do so infrequently, and primarily with a single *academic* partner. The prevalence of academic partners but the absence of networks reflects the weak state of collaboration and knowledge flows between universities and other actors – whether firms, marginalised communities, social organisations or government.

Interaction with community actors was most prevalent at the rural university, based on a long-standing orientation to social and economic development. It was also growing at the university of technology, in an extension of its traditional use and applied-knowledge orientation. The tendency for interaction with communities to be oriented to teaching and learning, or to outreach and service types of relationship and channels is highlighted. In the South African context, there is a strong orientation to philanthropic and charitable forms of interaction with communities. Examples cited are community service to enhance facilities in crèches or schools, university student tutoring programmes for school children, feeding schemes or collections of basic necessities from amongst academics. Service learning, in the form of community or enterprise learning related to professional training, was evident, particularly at the university of technology and the comprehensive university.

Most of the research activity with actors other than academics was reported to be with firms. The most common forms of relationship with firms are uni-directional, driven by firms' passive strategies and with little benefit to the university, namely, consultancies and contracts (Kruss 2005). Very little interaction was oriented to innovation and technology transfer, whether with firms or communities, but again, this was more likely in the university of technology and the comprehensive university.

In this context, it is not surprising that it was difficult to find instances of one highly specific form of interaction – academics interacting with marginalised households and communities in relation to innovation that can enhance livelihoods. The institutional policies, structures and mechanisms that enabled or constrained these patterns of interaction remain pertinent for the analysis of our case studies in the following chapters.

Upgrading the capabilities of women in an informal clothing enterprise: the interaction between a university of technology and an NGO-led social enterprise

A women's sewing collective and social enterprise supported by structured interaction with a university of technology

The interaction between the university of technology and a hybrid NGO/social enterprise presents a rich example of process, product, market and organisational innovation in the activities of a marginalised community in an informal setting. These innovations are used to address the livelihood problem of chronic unemployment among unskilled people. The interaction and the associated innovation are supported by interface structures that have been established within the university and by the funding mechanisms that support the main academic partners, which originate within the national Department of Science and Technology. At the same time, the leader of the social enterprise has shown how individual strategic capabilities and choices at the interface between a community organisation and its academic partners can play a crucial role in the establishment and maintenance of mutually beneficial and long-term interactions.

The social partner is an umbrella non-profit organisation. The community is located in a low-income area, and experiences high levels of unemployment, exacerbated by low levels of skill and socio-economic development. The community exists on the boundary of formality, and is characterised by the operation of informal economies and the habitation of informal housing structures in some areas. The community partner is formal in some senses – it is a registered NGO – but its operations do not appear to be highly formalised, and the community participants are certainly from a marginalised context.

As part of its activities, the NGO established a small-scale, informal, clothing social enterprise that would provide training and improved livelihoods for unemployed women – largely middle-aged, uneducated, African women. To achieve their purpose, they entered into a partnership with a local university of technology, which had a strong institutional commitment to community engagement, service learning and work-integrated learning. The partnership was facilitated through an external interface structure located within a faculty, a clothing and textiles technology station. This external interface unit, in turn, was driven and funded by a national science and technology policy intervention to facilitate technology transfer from universities of technology to SMMEs, with national funding and technical support.

The interaction centred on technology transfer to upgrade the capabilities of the women in the informal enterprise from a limited capacity to produce garments on domestic sewing machines to the capacity to produce in the quantity and to the quality required by formal markets. The university

provided training and access to industrial machines, cutting-edge technology design equipment and business support.

The university benefited in that the project provided opportunities for service learning for students, for technology transfer to SMMEs and communities, and for research. From a situation of piecemeal work on domestic sewing machines, the social enterprise is now able to design new products, manufacture on a small scale on industrial sewing machines, and access local markets, with varying degrees of success, to enhance the livelihoods of its members. However, the capacity of the social enterprise is small, in that it trains approximately 20 people per year, and provides a direct livelihood for five to ten people at any one time, depending on commissions.

In this chapter, we examine the interactive mechanisms and innovation dynamics required to create and support this livelihood opportunity.

Overview of the engagement: a university–community strategic partnership focused on innovation and skills development

The interaction began in 2002. This arose out of internal reflection within the NGO – the realisation that a shortage of skills was a key constraint on their operation, and that such skills might be available within the local university of technology.

We felt that, looking at the organisations around here and the lack of skills ... it's not always the case that people at NGOs can be able to employ people to come and do the work. Let's say for instance that I need a bookkeeper, and I don't have funds to employ one. And we said what about approaching universities who have students who are doing different kinds of things who can come and practise what they are learning and come as volunteers and at the same time learn and try to implement what they have learnt from the university. It started like that ... We as the community organisation felt that universities have to come and give support to NGOs or community-based organisations in the sense of skills transfer, sharing their expertise and also coming to learn from what is happening down here. So that was the main purpose of going to them.⁸

As a result the leader of the NGO contacted the rector of the university directly. She was able to do so in her capacity as an educated professional social worker and, hence, an agent able to broker relationships on behalf of the women in the sewing project. The request was received with interest, and referred to an academic, with whom she discussed the vision for the NGO.

However, the timing was not fortuitous, as it coincided with the merger process, which meant that potential partnership was postponed. In 2005, when the merger had been completed and the political and administrative climate was more favourable, the university actors renewed the dialogue. Reportedly, at senior management level, one of the deputy vice chancellors encouraged a newly formed unit for community engagement and service learning to explore options for external partnerships. Interaction with the NGO matched the aims of this new department and its research thrust. The unit served as a broker internally to match the NGO with the academic department that would best meet its current needs. This brought the newly formed technology station into the network.

At this point, the timing was fortuitous, and the relationship has continued in a range of forms since then. The sewing enterprise had recently won a contract to produce waistcoats for a tourism and safari firm, but were struggling with the skills and equipment required to fulfil the contract. This project

8 From interview with NGO leader

was suitable for partnership through the university's service learning programme. Given the shortage of skills and equipment at the NGO, training and manufacturing were first carried out at university premises:

We did that order together, in the sense that because we didn't have the machinery and the skills to do that, they took a group of women to get trained there and do that order there – to use their machinery and everything; to use their staff to supervise the ladies who were doing that product.⁹

The initial partnership proved beneficial to both sides, and the academic suggested that they continue working together through future contracts and thus foster a longer-term relationship. Through further dialogue, the sewing enterprise's needs were assessed and a programme of interaction was established. The technology station introduced technology and processes new to the social enterprise, in the form of industrial sewing machines. These replaced domestic sewing machines, which could not be productive enough for the participants to earn a living in the highly cost-competitive clothing market. During a later process of renovating a new building, the social enterprise moved their offices and manufacturing to the technology station premises. This played an important part in establishing the technological skills and capabilities of the sewing enterprise in its current format:

The university of technology accommodated us, literally, for six months while we were busy renovating this place. We used their machines, and we used their staff members, they really empowered our people to be able to use any kind of machine – that I can single out.¹⁰

The technology station then played a brokerage and support role, by helping the social enterprise to source funds to purchase industrial sewing machines and equipment for their own operations. The NGO was able to secure, through the Small Enterprise Development Agency (SEDA) technology programme, about R400 000's worth of equipment. This was a learning process for the women's enterprise, as the technology station team assisted with the paperwork process. Such supportive channels of interaction are typical of community service and outreach, and are not aligned with core academic activities. They are, however, part of the array of services offered by the technology station.

After these initial one-way, service types of relationship, where the technology station expertise was primary, a more equitable and active form of interaction began to evolve. Significantly, the main channel of interaction was through clothing and technology students and interns. When students complete their service learning projects, the usual course is for the interaction to end. Instead, the technology station developed this project further as they felt it was a vibrant project that had a strong and proactive leader who had steered the organisation over the years, and hence had great potential:

One of the key things that makes community projects function well is good, focused, strong leadership.¹¹

The initial emphasis for training was on achieving industrial quality levels and industrial productivity targets. The women needed to be 'pushed' to a point where they were able to produce a higher number of garments per hour, and also meet the minimum quality standards of potential customers. In addition, a team of an intern and students began to develop products for the sewing enterprise, experimenting with ideas, designs and prototypes:

9 From interview with NGO leader

10 From interview with NGO leader

11 From interview with university of technology academic

*We played around with products. In that way it was a learning experience for us – to see what works and what doesn't work.*¹²

The first product developed after the initial period of training was a shirt. A simple design was intentionally developed as part of the learning process in manufacturing. At this point, the project began to become mutually beneficial, in that it supported training and learning for students directly linked to their curriculum and future occupational roles, in the context of a paucity of suitable sites for work-integrated learning.

Such design and prototyping channels of interaction are a prevalent form of interaction between universities of technology and firms in South Africa (Kruss 2005). What is evident here is a growing knowledge exchange, as the students' theoretical knowledge was being applied in real-life economic conditions. The marginalised women involved in the project were beginning to participate in 'doing-using-and-interacting' forms of innovation in partnership with the theoretical knowledge of the student interns, and the high-technology skills of their academic supervisors.

Once basic skills and processes were established and the sewing team was 'up and running', the technology station assisted in terms of formal market development by introducing the social enterprise to a large low-cost South African clothing retailer. The result was a large order to produce 20 000 ladies' long johns. Two interns were sent to work with the women in the social enterprise to produce this order. One intern focused on supervising the manufacturing process, including meeting deadlines, and the other focused on quality control. Both interns trained the women in the sewing project and the NGO staff in these skills, remaining with the social enterprise for two years.

The formal market contract was a great challenge and a learning experience. The retailer's margins are very low – they largely sell low-cost mass-produced commodity items imported from economy-of-scale destinations such as China. The sewing enterprise had to produce at high levels of productivity in order to reach profitability on the contract. The women could not reach the required productivity levels, and although they learned a great deal about manufacturing processes and increasing output, they did not receive much income from the contract.

*[The contract was] a big challenge which doesn't have any profit at the end of the day. It's a nightmare actually. I wouldn't advise anybody who has a small place like us to take a challenge like that because it needs a big space; it needs to flow and you need people who know exactly how the stuff works ... [It was a learning experience] ... I'm telling you we still laugh about it today.*¹³

Reflecting on this experience led the enterprise, together with university staff, to consider other options. The technology station again played a brokerage role, facilitating the supply of laboratory coats to the university. This was a suitable product with a simple design, relatively high margins, a secure market, and long lead times for production. Although this created a long-term formal market, it was small and seasonal.

The technology station then encouraged the sewing enterprise to explore their own markets, by providing strategic assistance with marketing and business planning skills. This entailed engagement at a more senior level. An academic ran a workshop to develop their strategic plan and identification of potential markets. The process helped to achieve buy-in from all the NGO staff to change to a new more market-competitive orientation. By the end of this process they had a strategic plan for the next three years. This was considered '*another stage of their growth and their development*'.¹⁴

12 From interview with university of technology academic

13 From interview with NGO leader

14 From interview with university of technology academic

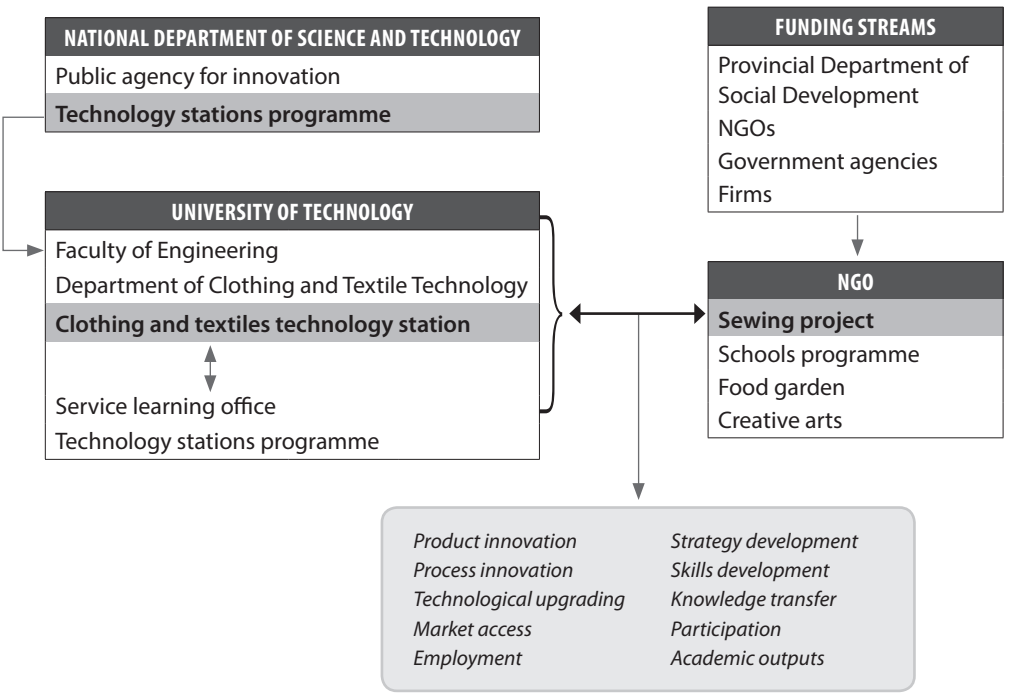
As a result of their new strategic orientation, NGO staff and sewing enterprise members developed new-to-firm products and new local markets, for example manufacturing school tracksuits for local schools, and a uniform for the local police choir. Their partnership with the technology station has continued but now primarily in relation to design and prototyping support for their own product ideas. This set of interactions – service learning placements, intern placements, academic interaction, strategic guidance and technical assistance – has continued since 2005.

The structure of interaction

The main point of contact between the NGO and the university of technology lies at the leadership level – between the leader of the NGO and the core academic. The process of interaction has become increasingly streamlined as the relationship has matured, but in essence follows a typical pattern: the sewing enterprise identifies a market. To design the clothes they approach the university of technology and use the advanced design and prototyping facilities. They then set up production with the help of staff, interns or students from the technology station. During production, service learning students sometimes continue to be part of the process. The flow of interns and students varies according to the women’s requirements.

Figure 4.1 provides a map of the actors involved in the interaction, and the flows of knowledge and resources. The university receives funding from the national Department of Science and Technology, while the social partner receives funding from a variety of public and private sources, and interacts with other universities in relation to other projects. It serves as a graphic reference point for the analysis of each of the partners that follows.

FIGURE 4.1 *Map of interactive partners: women’s sewing collective*



The community partner

The NGO is an umbrella non-profit organisation that includes an element of social enterprise. The organisation's origins are characterised by a charitable, philanthropic community service thrust. They lie in an initiative by the late husband of the current leader to set up a feeding scheme for poor and unemployed people in the oldest township in Cape Town. From this experience they realised that the challenge of alleviating poverty required more than a soup kitchen, and needed a more strategic and coordinated approach. In 1998 a community-development organisation was formed, and has since expanded into a broader portfolio of activities and programmes to address poverty and the quality of life. The structure is a hybrid of an NGO and a social enterprise. In this model, products from the food garden, sewing unit, and creative arts programmes are channelled into a 'trading unit' that generates income to feed back into the organisation.

The scale of operation has grown over time, but the direct reach to marginalised communities remains on a micro-scale. As an indication, the targets for 2013 include:

- Involvement of 500 children, 100 youth, and 100 women in the schools programme
- Involvement of 30 people in the food garden, including training for 20 people and sustainable incomes for 30 people
- Involvement of 10 people in the creative arts programme
- Involvement of 15 people in the sewing programme, including 15 people receiving sewing training, five people participating in entrepreneur development training, and the creation of 10 jobs.

At the time of interviews, there were five women working in the sewing livelihoods project as well as five trainees. The project trains approximately 45 people per year, and draws on this pool of skilled people when they work on larger orders. Trainees are drawn from a range of low-income areas, and are not restricted to women in the immediate location of the project premises. It is evident that most of the women are middle-aged, as a strategic concern was the inability to attract young people to sewing work.

The organisation has grown substantially since its inception, and become increasingly formalised, with a management committee, and a staff complement of 13, including 3 social workers and 3 trainers. The leader is a social worker, and by all accounts, provides dynamic leadership, with a strong strategic orientation. The organisation is now housed in a building, owned by the city council, that had fallen into disuse and disrepair. It uses the building in return for a low rental on condition that repairs were conducted,¹⁵ and it has become something of a local hub for community services.

Other university, local government and funding partners

The NGO has cultivated a range of relationships with other actors that support their activities more generally. They interact widely within the university of technology, with service-learning programmes in departments of human resources management (to help with labour relations), multimedia (to help with their website) and civil engineering (to assist in the renovation project – cleaning, painting, installing wiring, for example).

There are also ongoing relationships with other local universities, such as students from a social work programme being placed in its programmes as part of their practical training. Links with other NGOs support their programmes and create networks of cognate NGOs, and partnerships with funders provide much-needed resources, such as equipment from the Department of Trade and Industry's

¹⁵ Of note, these were effected with support from the departments of engineering and student volunteers through service-learning programmes.

SEDA, or funding from the Community Chest, the National Lottery and a large insurance and financial services firm through its corporate social investment programme. Together, these links indicate that this NGO has a strategic capability to build partnerships and networks to achieve its developmental goals.

The higher education institution: the university of technology

The set of institutions that came to form the university of technology date back to 1920, and a complex trajectory can be traced of shifting forms of technical and vocational education and research, interconnected with racially and spatially segregated institutional identities. Today it is a large institution, with an enrolment of 32 000 students, of which 94% are in undergraduate programmes, and approximately 50% in fields of Science, Engineering and Technology (Kruss et al. 2012).

The nature of interaction with external social partners is likely to be distinctive in a university of technology (Kruss et al. 2012). Programmes and curricula are more closely aligned to business and community needs, and involve a range of integrated experiential learning strategies, such as 'co-operative education', work-integrated learning and service learning. In terms of research, universities of technology have developed multidisciplinary applied R&D centres operating as technology platforms, offering services such as design or rapid prototyping (De Beer 2010) or contract research, training and consultancy.

The institutional purpose and goals thus contribute to explain why the approach from the NGO was received favourably at a senior level of the institution. The institution has created a number of internal and external interface structures that promote and support such interaction.

The clothing and textile technology station

The distinctive nature of the clothing and textile technology station as a highly structured, strategically oriented, and well-resourced innovation actor with the ability to create an external interface between the university of technology and marginalised community partners is critical.

The national Technology Stations Programme¹⁶ is an instrument of national science and technology policy to provide financial and technical¹⁷ support to universities of technology to enable their interaction with technology-based SMMEs in specific industrial sectors related to regional priorities. Funding draws on multiple sources, is quite generous, and is used to support equipment, staff, interns and the development of intellectual property. The technology station is thus a distinctive organisational form within the South African higher education sector.

The clothing and textile sector historically was a large-scale employer in the region, but has come under threat of competitive pressures caused by cheap imports from China. Clothing and textiles were selected as a focus for the platform, to provide support that would revive an ailing sector where local production has increasingly shifted from large firms to many small-scale operations, including in the informal sector (Van der Westhuizen 2006).

16 Established in 2002 and now under the line function of the Technology Innovation Agency to ensure a more coordinated approach to 'bridge the innovation chasm' in South Africa.

17 A bilateral agreement between the DST and Deutsche Gesellschaft für Internationale Zusammenarbeit (GTZ) was established to provide technical support to the Technology Stations Programme (TSP). GTZ contributed towards strengthening the TSP through skills development and international links and visits, either by experts or to places where TSP stakeholders could learn.

The technology station includes lecturers, researchers, interns and students. They benefit from a well-funded and well-equipped set of laboratories that are in line with the current requirements of clothing manufacturers. Their mandate is to provide innovation support to SMMEs, but they in fact engage with the full range of firms, from micro to multinational. Significantly, they also have a number of encounters with non-firm actors that are livelihood-oriented and based in informal settings, for example community projects, NGOs and community operatives. The driver for interaction is to meet their applied research, teaching and technology-transfer mandate from both the national Technology Stations Programme and the university of technology.

A focus on product innovation is a result of reflection as well as direct experience. In 2004 they undertook a 'rapid appraisal of local innovation systems', where they engaged with approximately 90 local stakeholders, firms and research organisations. The key areas lacking were manufacturing advisory services, and access to specialised equipment, which informed their niche focus. To provide access to equipment for SMMEs or community enterprises, they leverage the capital equipment at their disposal. For example, an extensive product-testing facility is accredited by a large South African clothing retailer, and it owns an expensive button-hole machine. They also use a new technology to create virtual prototypes of products, to design a pattern and use the software to virtually clothe an avatar with the digitally designed garments. This technology is relatively new to the industry, in South Africa. One advantage of using this software is that it saves time compared to manually creating prototypes, and it can interface with older technologies. For example, they may have partners who send designs by fax, and using the software they can send patterns back by email. Box 4.1 provides examples of projects, with community-based co-operatives and social enterprises, to design such prototypes and patterns.

The technology station runs numerous short courses and accredited training programmes that are mostly attended by large firms and SMMEs. It tries to include small firms and social partners in these short courses: if they cover their costs through attendance from large firms they invite selected social partners to attend at reduced costs or for free.

BOX 4.1 *Design and production of prototypes with communities*

A micro-enterprise operates in townships, producing beaded bags and accessories. Prototypes were taken to a trade mission in Sweden through a Department of Trade and Industry sponsored trip, and sold at South Africa's largest design conference.

A community-based co-operative in a fishing village on South Africa's West coast won a contract to make bags for the storage of industrial fish meal. The technology station sent interns to run the project and to train co-operative members to make the bags, with oversight by the academic leader.

A partnership with a group of disabled people, who use modified equipment to sew, led to the development of a prototype device. One of the academics encountered a disabled sewing machine operator who used a stick to activate the foot pedal of his machine (sewing machines are traditionally foot-operated). They took this idea to the mechanical engineering department, where they developed a prototype hand-operation kit that a disabled person can attach to any sewing machine. The plan is to roll out this prototype so that disabled people can work more easily in the clothing sector.

Organisational arrangements and interface structures

Interface structures

The institutional policy framework shapes the form of interaction. Every undergraduate student at the university must complete a service or work-integrated learning project in a firm or community context. This is graded and forms part of their academic and practical training. Such activity is part of the core mandate of all academics, and is facilitated by a dedicated internal interface unit that falls directly under the portfolio of a senior university leader, responsible for research, technology, innovation and partnerships.

The centre was established as a response to national calls to institutionalise community engagement, defined as:

... those activities and programs offered by the institution which involve collaborative interaction with external individuals, groups, and organizations at the local, regional, national and international levels to achieve economic and social objectives using engaged teaching and learning initiatives, volunteerism, research and various forms of work-integrated learning, such as service learning and cooperative education.

(<http://www.cput.ac.za/component/content/article/313>).

The centre integrates three units. One coordinates volunteer and outreach programmes for students and staff, and another is responsible for nurturing industry partnerships that result in student workplace experiential learning as part of degree requirements, with most placements in large firms rather than SMMEs. The service learning unit drives the integration of community engagement with teaching, learning and research, '*straddling curriculum and community*'.¹⁸ They identify potential projects in local communities, then approach the relevant government department or local organisation to secure community entry, and act as a facilitator of academic engagement within communities. They have a budget to cover expenses such as materials and transport, and work closely with the formal fund-raising unit of the university to seek co-funding for service-learning projects.

There are thus institutional drivers of community interaction at a high level, and the work of the technology station is fully aligned with these commitments. Service learning is curriculum focused, and students get credit for their community-based projects. Interns play an integral role: most of the work is carried out by the technology station manager with the assistance of interns. The interns each report to an academic staff member, who manages their progress on projects, and advises them where there are challenges.

The service learning unit views it as important to cultivate a long-term relationship, as short-term relationships often compromise success, due to a culture or practice of achieving 'targets' rather than lasting impact. This scenario is common, and reportedly occurs in 80% of cases. Hence, now, instead of assigning students to work with a social partner on a once-off basis, they maintain a relationship by assigning new students to the same partner the following year. Likewise, since the university operates according to an academic year, the programme of interaction was divided into stages that could roll out sequentially over several years. Because of the importance of job creation and sustainability, over the past few years the unit has tried to shift its portfolio increasingly towards environmental and livelihood issues. In this context the service learning department often serves as a nexus, connecting funders, firms, community organisations and the university:

¹⁸ From interview with service learning officer

We are moving away from the traditional way of doing service learning and we are leaning more and more towards innovation. So, if we look at sustainable livelihood innovation, we formed partnerships with a project management and a technology company. This partnership was formed because we were approached by the companies and they wanted to work with communities but they don't want the innovation developed to belong to industries. They wanted to keep it as a social project. We have adopted social innovation projects as a way to perform service learning.¹⁹

Although each service learning project is unique, there is a general process that is followed. An academic approaches the service learning unit with a request to help set up service-learning activities for their students. The unit then helps to identify a community, and begins a series of community meetings to learn about community needs and prospects for working together. This includes a needs assessment conducted by the students involved – basically asking communities what their challenges are and what they want the university of technology to do. The unit evaluates their needs and liaises with the relevant government and private sector partners in order to begin lining up community access and funding.

The students follow a structured and iterative process. They make a series of (about three) presentations, where first the academic, the service learning unit and the partners involved will collaborate on developing a concept for the project. Once they have a rough concept and all this is communicated to all stakeholders, the students design in more detail a project that speaks to these needs. Then the students present the concept within the university of technology and are given feedback before presenting the planned project to the community. A typical project management model is used, led by the academic (including minutes, reports, project plans and schedules).

During this process, and during the project itself, there is fieldwork oversight from academics. If an academic cannot be on site (for example there are cases where over 100 students go into the field at the same time), they aim to have an educator at each site who is responsible for the students in terms of meeting them and managing their resources.

At the end of each project there is a 'reflection session' where students present their experiences of the project, and in cases where there is a tangible output they present that too. *They hand it over to the community so it's kind of a ceremony.* At the end of the year the service learning unit conducts evaluations of the projects, in which they obtain feedback from all stakeholders. This includes suggestions for improvements that can be implemented in future projects. This forms a basic monitoring and evaluation system.

The service learning interface structure presents both enablers and challenges. A key enabler is that the unit forms a hub for communication and coordination:

The reason the model works is that there is a central strategic unit that is coordinating the partnerships; that is an important element. There is a lot of work but the only way something like this works is if you have people who are committed and committed partners that pull together.²⁰

¹⁹ From interview with service learning officer

²⁰ From interview with service learning officer

One of the main challenges is managing expectations among community partners:

One of the challenges working with the community is that they want solutions now. The reality is that higher education institutions work in a structured environment. It's quite challenging when you engage with communities who expect results immediately.²¹

Another challenge is negotiating local community politics and personalities:

It is important to be able to identify the right people, because sometimes when working with community members you might find that it is not representative of the whole community ... Conflict within the community is also a challenge. There is a lot of political interference and issues going on in the community. For example, different groups within the community (councillors and community). Working with different personalities can also be challenging.²²

The role of the technology station as an intermediary

One of the functions of the technology station is to serve as an external interface mechanism. The starting point is to support the community organisations' proactive innovation strategies, through the identification of a core product. The technology station previously focused on reactive strategies such as short-term training. Without a product to offer to a market, these skills sometimes went unutilised, and the team realised that skills without a saleable product were insufficient:

*We therefore took a step back and decided to work on product development – that is finding products that these communities can make **within their skills level**.²³*

When it comes to an actual product that a SMME or community partner can sell within the context of a competitive market, innovation support is critical. We have stressed that wherever there is technological or organisational upgrading, there is innovation to some extent, which, in turn, requires new skills for the actors involved in production.

The strategy was one of promoting innovation that is 'new to the firm', or social enterprise, with technological complexity within the existing skills levels of the community-based partners. For example, they begin with simple products, such as bags, pillowcases or tracksuits. The technology station thus teaches simplicity while at the same time aiming for quality that meets the regulatory standards of potential formal markets.

The main focus of product development in the clothing value chain is design and the creation of patterns. In this context 'patterns' refers to measurements and specifications for the selection and cutting of fabric, while design refers to the prior stage of concept and 'look'. If an individual or SMME approaches the technology station with an idea for a product, staff and interns work with them to design a clothing range. The next phases are more technical – sizing (developing specifications for different sizes of the garments), grading, marker making, and so on. They have the facilities to make patterns digitally, and this is commonly used. The technology station also offers assistance with setting up the manufacturing equipment, processes and flows. Ultimately, learning and independence are encouraged:

21 From interview with service learning officer

22 From interview with service learning officer

23 From interview with academic

What we always have to do is withdraw ourselves from the project so that it runs on its own ... which has been a difficult thing to do ... So reluctantly we push them away, and we then try to get them to operate on their own.²⁴

The technology station does not provide business support, which can be a major skills gap for social enterprises, so they assist their partners in forming other external partnerships. There are several possible sources of business support, particularly by public funding organisations such as the SEDA, or regional industry bodies.

Organisations in the informal sector are encouraged to become registered as co-operatives, as this is required for access to government funding. Unregistered organisations operate 'under the radar'. There are some benefits to this, such as lower administrative and taxation burdens, but the benefits of being registered are greater.

The technology station is thus able to broker access to funding and support networks for community-based enterprises, in addition to its primary focus on innovation and technology support.

Community interface structures

The NGO engages with external actors primarily through the strategic relationships (with individuals) and partnerships (with organisations) cultivated by the leader. Long-term and mutually beneficial working relationships have been actively pursued and maintained over a period of several years.

A sustained relationship between the NGO leader and the head of the technology station facilitates communication. When there is a requirement for a new intervention, direct dialogue initiates further interaction between the two organisations. The engagement is, however, not limited to this level, and there is ongoing interaction between trainers and trainees.

Although their relationship with the contact point academic is described as smooth, at the operational level the sewing enterprise interfaces with other academics, and this at times is not optimal:

Sometimes people take so long, and it hinders our work ... Sometimes some of the things just slip off ... It becomes a challenge when people don't do what they are supposed to.²⁵

There is occasionally a lack of 'buy-in', which creates stumbling blocks to the interaction:

There are departments where lecturers just send students and do not even follow that up to find out where students are. For me, if I'm a lecturer I would be interested to know where the students are. Even if it's one visit, so that when they say something at least you have an insight of what they are saying, and you have an understanding of where your students are placed and the conditions and the situation and circumstances.²⁶

Uneven levels of efficacy within the university are thus a challenge for the community partners.

24 From interview with academic

25 From interview with NGO leader

26 From interview with NGO leader

Drivers of interaction

The partnership was driven by the academic technology-transfer project of the university of technology, and the proactive strategy of the NGO. The initial motivation for interaction was strongly driven by the community-based social enterprise's proactive strategy – the realisation that a shortage of skills was a key constraint on their operation, and where such skills and missing expertise might be available.

The motivation was underpinned by an assumption that the university should serve communities, but also that there may be knowledge in communities that can add to the university.

From the university's point of view, the driver behind the initiation of the relationship was related directly to higher education imperatives and dynamics, to promote community engagement. There are both intellectual and financial components to these drivers: the fulfilment of the engagement function of the technology station is required for continued funding, and is also an essential part of the learning experience for students and interns. Intellectual imperatives are more important for the service learning unit contribution, as this is seen as an essential component of the learning experience for the students in general.

Over time, these drivers have resulted in learning for each actor and, as we shall see below, increasingly bi-directional knowledge flows.

Innovation

The interaction includes multiple aspects of innovation, including elements of process innovation, product innovation and market innovation. These are primarily 'doing-using-interacting' modes of innovation to promote learning and build technological capabilities, new to a small enterprise, rather than science and technology-led modes of innovation new to a sector or at the technology cutting edge. The technological upgrading and process innovation are new to the sewing co-operative, but not novel in any wider sense.

Technological upgrading

At an early stage in the engagement, technological upgrading created a platform for product and process innovation. The installation of new industrial sewing machinery, replacing old domestic sewing equipment, made it possible for the social enterprise to compete in the clothing sector through higher levels of productivity and quality. Another aspect of technological upgrading has been the use of advanced machinery at the technology station premises. This has supported the product innovation that has allowed access to new markets.

Product innovation

Product innovation has been a central feature and has taken on a number of aspects. Firstly, across all products, quality improvements had to be made in order to access new markets. Quality assurance has been a constant aspect of the learning relationship with the technology station, and has featured in all the interactions related to the establishment of production processes.

Once a potential new market has been identified, a product development team, consisting of an intern, students and the sewing enterprise staff, experiment with product ideas, and together produce designs and prototypes. This new and collective product development capacity has been central to the engagement's success:

Whenever we wanted them to make some samples we would go to them and say, 'can you help us make this sample?' They would design the sample, give it to us and we would start making ourselves, they did not make them for us. They would cut it and give it to us whenever we want them to make anything. Whenever we want something we go there because they are like a resource to us. For example, if you came to me and said 'can you make this shirt for me?' We would go to them because they've got computers and so on. So that we know that at the end of the day, your product is of good value.²⁷

Process innovation

Process innovation has focused on manufacturing processes. With the introduction of new industrial sewing equipment, staff from the technology station assisted with the set-up of this equipment in order to streamline production. There have also been ongoing efforts to improve the production process in order to achieve higher levels of quality and productivity. From the point of view of the core academic:

We had to align them to current manufacturing processes that they weren't aware of, in terms of how a clothing factory run, how is the production line set up, and so on.²⁸

Market innovation

Without market innovation, product and process innovation would be rendered ineffectual. The sewing enterprise did not have networks or market access and community members' marketing skills were limited, hence it was important for of the technology station to play a brokerage role to connect with potential customers. Market innovation has been supported by organisational innovation. The co-development of business plans has initiated the identification of possible markets and provided parameters for product development to access those markets.

Organisational innovation

Underpinning product, process and market innovation has been ongoing and incremental organisational innovation. Many learning processes that have emerged from the interaction have led to organisational changes and improved capacities for innovation, production, marketing and strategy. For example, technology station staff involved NGO staff in the paperwork process of applying for an equipment grant from the SEDA. Through this the NGO learned about funding and interfacing with public agencies.

²⁷ From interview with NGO leader

²⁸ From interview with academic

The process to develop business plans originated in student projects, but they established organisational processes within the social enterprise that approached markets and production in a more strategic and integrated manner. A workshop to develop a business plan was a critical step in the evolution of the organisation, rendering a three-year plan to coordinate marketing, innovation and production.

Knowledge and skills

The NGO's skills shortages and knowledge requirements were a central driver of their involvement. A process of mutual learning evolved from the first product, which required on-site training at technology station premises to support the manufacturing. This illustrated that the university of technology could benefit from such engagement by providing practical experience to its students, and that the sewing micro-enterprise could benefit from training and new knowledge. This served to clarify knowledge needs and set up a plan of action that included a substantial knowledge component (intertwined with an innovation component). The primary channel of knowledge exchange was through the service-learning programme, including students, interns and overseeing academics, as well as more direct and targeted training interventions.

Interviews with individual community participants highlighted that the most important new skills learned, from their point of view, were sewing skills and teamwork skills. Their involvement taught them to operate as a team in an industrial setting. Sewing skills continued to be developed over time, with each new contract. The ongoing relationship continued to provide a learning context for participants, including the skills required to identify markets, co-design new products, and develop organisational strategies and external funding streams.

Initially the channels of interaction were mostly uni-directional, with expertise and resources flowing primarily from the university of technology to the social enterprise. Over time, the nature of the interaction became more bi-directional, with an increasing degree of knowledge exchange evident in the interaction. While the academics, interns and students bring formal and codified knowledge, as well as embodied knowledge in the form of equipment, into the organisation, it is also recognised that they gain tacit knowledge from their experiences. This brings an important degree of mutual benefit and mutual learning to the engagement:

You know they never realise that they learn more here, than at the university. You know they get a lot of knowledge here. They get such a lot of knowledge from these ordinary people. And also from my encounter with them – I'm a social worker actually by profession – they get a lot of knowledge from that side of sewing and here [social work]. They soon realise that experiential knowledge can be as important as book knowledge ... the quality controller will come with theory but ordinary people will come with common sense. We have a woman here who is so good that everything she touches is just quality. It's not just pushing quantity but quality. Sometimes when the theory doesn't work, you have to learn from other people.²⁹

Interviews with community participants revealed that they too are aware of the bi-directional nature of the knowledge flows:

I would say they learn from us as well. They don't just teach us stuff. I mean some of them come from the university with their own assumptions of how people in the township live and how we do things. They often arrive disillusioned and go back having learnt quite a lot.³⁰

29 From interview with NGO leader

30 From interview with community participant

They learn just by being in this environment. We do not necessarily say ‘this is how to do X or this is how to do Y’. They learn by observing and by being here. But to give a typical example: some come directly from university and they don’t know how to work, at a practical level, with people and about people and so when they leave here they would have learned some of those things.³¹

Community participation

The NGO is driven by a capable and strategic leader. While this has positive effects, it also constrains the scope of community participation. The evidence does not suggest that community participants played a substantial or active role in making strategic choices. Community participation has taken on a vertical character, with the leader of the organisation acting as the primary contact point for engagement with the university of technology, and driving these exchanges. Participation by marginalised women in the sewing enterprise, however, is active, primarily in the areas of training, knowledge exchange and manufacturing.

Outcomes and benefits

Table 4.1 on the following page summarises the outputs, outcomes and benefits of the interaction. The main output and outcome of the interaction is that, over time, under the leadership of the director of the NGO, previously unemployed women have become more active agents interacting with the university academics, students and interns, to develop skills, to innovate by developing new-to-enterprise developing new-to-enterprise products, processes and organisational forms and to create their own livelihoods.

The impact of the interaction has been positive in terms of employment. There have been several channels for community participants, particularly once they have received training and built up their skills in clothing production. One option has been to exit the NGO and work independently, starting up their own micro-enterprise – if they can gather sufficient funds to purchase their own equipment. Others have found work in the formal clothing and textile manufacturing sectors. Another option has been to find jobs in unrelated sectors – thus placing the sewing enterprise more in the position of a stop-gap than a skills platform. Others have continued with the NGO and remain members of the co-operative.

However, it seems that payment for community members was inconsistent in the early stages. Whereas some of the community participants expected wages, in effect they received ad hoc income as it became available to the co-operative. According to the community members who were interviewed, long periods would pass without their receiving any wages or other forms of payment:

We were not getting paid in the initial phases of the project. Others thought we would get money instantly. So when it became clear that it would take time before we can get paid, they decided to leave. But it’s a question of patience because we were told from the start that we will not be getting paid in the initial phases of the project.³²

31 From interview with community participant

32 From interview with community participants

TABLE 4.1 *Outcomes and benefits of interaction between the university of technology and the sewing enterprise*

	<i>NGO and sewing enterprise actors</i>	<i>University of technology actors</i>
Outputs	Marketable products	Graduates with marketable skills and civic awareness
	Industrial manufacturing processes rather than domestic production	Academic publications
	Industrial sewing machines and equipment acquired by social enterprise	Postgraduate students
	Livelihoods for unemployed women on a very micro scale	Completed technology-transfer projects
	Access to new formal and large-scale markets	
Outcomes	Strategic plans and planning skills for the NGO	University of technology developing a reputation for applied research, teaching and development
	Access to high level technology for design and development of new products, for the social enterprise	Deliver on its mandate as a technology platform to SMMEs in region
	New production processes for the social enterprise	Workplace learning for students and interns (new graduates) to enhance their employability
	Skilled pool of marginalised women able to create livelihood opportunities	Developmental approach to work with micro social enterprises
		Learning in real-life production settings to inform university of technology theory and teaching
		Strengthened academic and interactive capacity of universities of technology
		Approaches to service learning and community engagement that use technology to enhance livelihoods for poverty reduction

The impact has nevertheless been positive in adding social value for the households of marginalised community members. It is clear that the income derived from the co-operative has had a beneficial impact at the domestic level, providing means to send children to school and to pay for basic household expenses.

*We earn a bit of money. Send children to school.*³³

*Our lives changed for the better – however little. I mean since we came out of the training and started earning you know that you can afford to buy a couple of household goods – groceries, clothe the children, send them to school etc. And even try to fix one or two things at home.*³⁴

These positive impacts on domestic life and employment have been constrained in scale and reach. The number of women trained is small, and the number able to rely on the sewing enterprise for a steady livelihood is even smaller. The NGO has been training people since 2000, but the overall impact of the training has not been large. Community members estimated that about 30 people enter

33 From interview with community participants

34 From interview with community participants

training each year, of which about 21 or 22 complete the training. Over the last 12 years, they would have trained about 460 to 470 individuals. The case study research did not yield sufficient evidence of the depth of the capacity and skills developed to identify and produce marketable and profitable high-quality products.

This achievement has taken an extended period of time; it has involved very intensive and direct engagement with academics and students, and it is costly in terms of the equipment on which much of the livelihood activity depends, as well as the time and technology expertise of academics and interns.

The academic outputs relate primarily to the students trained. The less tangible outcomes relate to knowledge production and technology diffusion within the higher education sector, for the community development sector and across the national system of innovation. The primary benefits relate to learning and the development of new approaches for interaction. The quality of teaching in the clothing and textile department is enhanced by the mutual learning, and the research and development agenda of the technology station is informed through ongoing reflection and procedures to be more responsive to demand. However, in terms of scale, the interaction with the NGO is time and labour intensive, and only a limited number of such interactions will be possible for a single academic. Over time, this has been mitigated by a model in which the academic supervises interns as the direct point of contact and manager of a team of students, which in turn, has the benefit of leadership training for these interns.

The case study thus faces the challenge of scaling up and replication. A lot of expertise, time and money may be invested, but this may impact *directly* on the livelihoods of only a very small number of marginalised individuals.

An alternative case: *It's new because we are the ones now manufacturing it*

The selection process identified a second case at the university of technology, located in a second technology station, this one focused on food technology and processing.

In terms of its mandate to support SMMEs, in the early phases of its establishment the food technology station provided services to a range of small-scale, informal livelihood projects. One of the staff members travelled extensively, offering advisory and consultancy services, drawing in potential clients to the university of technology. As the technology station developed its reputation, infrastructure and offerings, it partnered more extensively with formal firms, and large firms, for student training and technology transfer. It had few remaining partners in the informal sector at the time of interview.

The interaction with livelihood projects entailed simple technical advisory and business services, and support to comply with food safety regulations, for co-operatives. The knowledge flows were one directional and addressed immediate, short-term problems; the channel of interaction was expert advice, and there was little direct interaction between the university and marginalised communities aside from with the individual contact person. However, the projects were initiated and driven actively by individual community actors, and succeeded in accessing local government and community-based markets on a fairly sustainable basis. The basis for these conclusions is analysis of a best case example identified by the technology station staff in reviewing their work.³⁵

35 Interview with technology station managers

The interaction had only two main actors – two staff members of the technology station, and an entrepreneurial woman based in the Eastern Cape, who used every possible means to further her work, and provide opportunities for the women's co-operatives based in the impoverished communities that she undertook to serve. Her own history illustrates this drive:

My main challenge against my successes, firstly on my side as an individual I've never been in any business. I did not have a clue of business terms with my little education, but because I am a curious person, if I saw someone doing this I wanted to know why are you doing it, how do you make it and where is this thing going to take you. This is how I started because I never even worked in a factory. I've been a domestic worker for many years but in between I used to work for people with businesses. Sometimes you were given certain tasks, maybe the things are upside down in the office, and then this is how I started to learn, how to express yourself if you've got clients ... So I learned from them little things that have made me. So when I got into the community projects I was seen as a role player for most of the community members, because they thought maybe I am the one who can do this.³⁶

What became clear is that she had the confidence and sufficient understanding of systems to access numerous provincial government funding opportunities, through a provincial department of social development funding for co-operatives and various livelihood schemes:

That's why I never had a problem of just going to the departments, direct to MECs, even to the premier recently ... I have to go direct to you and then I put my position, this is what I am thinking of doing, and this is what I am expecting you to assist me with ... I never make an appointment, I just go to the department asking from which office she is operating and then they say, do you have an appointment, I say yes, when did she give you, last week, how, over the phone, they are not sure whether I am speaking the truth, and then they just give me access and then I am going there, so I am not struggling with anyone to build relationships, because I want to know the person directly.³⁷

The same entrepreneurial spirit characterised her initial and ongoing approach to the opportunities that could be gained by accessing the expertise the technology station offered.

In brief, a group of women who were historically organised in a traditional savings club, known as a 'stokvel', were offered the opportunity to mix and package soya mince for a private sector distribution company, and formed a co-operative to do so. The manufacturing process is simple, mixing of the soya mince is done by hand in small groups of approximately eight women. They felt that they were being taken advantage of and kept dependent, because they had no knowledge of how to make the mixture or get more value out of the business. It was evident that there was money to be made, and there are complex tales of splits in the group, court cases and large sums of lost profit.

On a trip organised by provincial government to a national food exhibition, the leader made contact with a staff member of the technology station, and since then has approached them on an ad hoc basis to provide expertise and support. Samples of the mixture were sent to the technology station for analysis, to determine the formula and ingredients for each of the flavours. Then, with initial funding from provincial government for raw material, the women in the co-operative were in a position to go into business for themselves.

36 From interview with soya co-operatives project leader

37 From interview with soya co-operatives project leader

Their markets are primarily government departments, such as hospitals, public works or school feeding schemes, but also localised markets based in marginalised communities, such as small spaza shops, crèches, old age centres and, after another government-sponsored trip, clients as far away as Zimbabwe. As the product is a cheap, affordable source of protein, they have a strong demand from poor households for the product.

A highly contextualised take on innovation as products and processes new *to excluded social groups* was raised by this case:

*I cannot say it is new to South Africa but to us as black people, we never had the expertise because we normally buy the stuff from the shops not knowing, but we never had anything that says, this thing, we can do it by ourselves, until we came up with that idea. **It's new because we are the ones now manufacturing it.***³⁸

The certification of the quality of the product by the technology station is invaluable for the co-operatives, which provides market confidence. Other support given by the technology station is advice for labelling and bar-coding to meet regulatory requirements, assistance to codify recipes, training on standards to access formal markets and preparation of the paperwork required and information on sourcing machinery. In fact, the technology station serves as a resource for any questions or issues that arise in the course of production – *'having them as an institute built my confidence in most of the work I am doing'*.³⁹

There has been limited up-scaling of the livelihood opportunity – the project was extended to two other women's co-operative groups in small rural towns, each with 10 to 20 participants. One of these projects has access to formal retail markets. It seems that provincial government has funds allocated for social development projects, but few of potential value in which to invest. The soya mince project concept funded by the provincial government has been adopted for funding other co-operatives, and the community-based project leader is employed to use her tacit knowledge and expertise to manage and support the new projects: *'they also do a cut and paste of our business plan for that area'*.⁴⁰ In this role the project leader also draws on the technology station, for example, taking women from the other groups to a food symposium at the technology station.

The project has been of little benefit to the university of technology. A project plan was submitted to provincial government for funding the initial and ongoing advice, but the technology station was never paid. There is no student placement as the distance is too great. The interaction is in effect a form of unpaid consultancy that is possible because of the mandate of the technology station to support SMMEs in terms of its public sector funding. Nevertheless, the external interface structure has directly and indirectly supported and facilitated the growth of this livelihood opportunity in marginalised communities in another province, with an entrepreneurial individual as the key intermediary.

38 From interview with soya co-operatives project leader, 2012

39 From interview with soya co-operatives project leader, 2012

40 From interview with livelihood project leader, 2012

Conclusion

We can conclude that these are two cases of interaction to promote livelihoods of marginalised women in informal settings, that have led to inclusive development – albeit, on a very small scale for a very small number of women. The sewing social enterprise has survived for some time, and provides a livelihood for women who are increasingly skilled, able to play an active role in identifying products for niche markets, use new-to-enterprise industrial equipment and machinery, and use the university of technology as a source for missing complementary technology and knowledge.

Over time, the interaction has contributed to student workplace learning, and to developing approaches that make the university of technology more socially accountable and capable of contributing to the national social innovation and poverty reduction agenda.

Enablers and constraints

The descriptive analysis allows us to identify the conditions that facilitated this interaction to transfer technology and introduce products and processes new to the informal social enterprise, in order to enhance the livelihoods of marginalised women, and potentially lead to inclusive development.

- The funding, technical expertise and research agenda of the national technology station policy intervention that provides extensive support and drives the mandate of the main university partner
- The mission and role of the university of technology and its commitment to service learning and work-integrated learning that provides support to the mandate and activities of the main university partner, and aligns it with university priorities
- The organisation of the technology station as an external interface mechanism with a physical infrastructure, high-technology equipment and facilities available to external partners
- The approach of the technology station to identify niche areas in which to focus activities, and to work in an inclusive manner with external social partners
- The leadership of the NGO that has a strategic, proactive approach to organising and building the capabilities of the women
- The availability of high-technology equipment and expertise as a packaged and responsive service available to SMMEs and community co-operatives
- The ability to access government funding programmes to obtain industrial sewing machinery and equipment for the social enterprise
- The funding available for interns to work directly with the social enterprise and lead teams of students in credit-bearing activities under the guidance of academics
- The tacit skills and knowledge that the women in the micro-social enterprise have to offer for student learning
- The capacity of the NGO staff and the women in the social enterprise – and of the individual leading the soya mince co-operatives – to learn from the interaction, and the capacity to source technology support and information to inform the design of new products from the university when required.

Constraints and blockages primarily relate to the difficulties of scaling up production and extending the potential benefits to a sizable group of marginalised women, which meant that markets remained small and oriented to local niche segments:

- The lack of commitment and timeous action of some academics that was identified by the NGO staff as a constraint, which relates to academics viewing their core roles as teaching and research
- The extended period of learning required on the part of the academics to inform their approach to interaction with community-based micro-enterprises and co-operatives

- The extent of human and financial resources required to facilitate the shift to industrial production and to quality, well-designed products
- The spread and depth of learning and technological capability building in the micro-enterprise required to support production on a scale sufficient to access formal markets, in the context of a global price-competitive sector
- Access to niche markets that match the skills levels of the women in the micro-enterprise and that can yield a profit.

Protecting the livelihoods of a marginalised fishing community through interaction with a research university

Sustainable traditional artisanal fishing practices: a fragile livelihood supported by knowledge, research and social innovation

In the case of the interaction between the research university and the fishing community in a small isolated hamlet, marginalisation is a recurring theme that has shaped the interaction from its inception in 1993 to the present day. The marginalisation of the fishing community has its roots in South Africa's colonial past. The community in its current form was created in 1925, when forced removals pushed what was then an agrarian community operating on fertile alluvial land off their ancestral grounds, and relocated them to their current position, on the banks of a river estuary. This forced them to change their livelihoods from agriculture to subsistence fishing in order to survive. A much smaller community of fishers had long been living in the area, and the new arrivals drew on their traditional local knowledge that had been passed down from previous generations (evidence indicates a history of fishing activity on the estuary that goes back several thousand years).

The marginalisation of the community was so complete that during the years of the apartheid regime they were effectively 'off the map', fishing in what was nominally a protected area, but so isolated from urban and power centres, and so cut off from any government development agendas, that they simply continued their traditional fishing livelihoods undisturbed by government intervention or support.

Ironically, marginalisation by the government became a serious threat to the livelihoods and very existence of the community only after transition to democracy in 1994. Under the new dispensation, the community continued to be without a voice in the corridors of power, being neither a sizable electorate nor holding any other political leverage that could make its way into the considerations of politicians or civil servants. As a poor, isolated, coloured (mixed-race), subsistence community, they were at the mercy of decisions made by policy-makers in Cape Town and Pretoria that were wholly uninfluenced by the specific circumstances of the community. That is, new legislation threatened to cut off their fishing licences in the name of protecting the marine resources of the estuary.

The problems of sustainability and marginalisation for the fisher community are intertwined in complex ways: on the one hand the community must practise its livelihood sustainably or it will be ecologically undermined, on the other hand the unilateral actions of government agencies have marginalised the community on the basis of sustainability questions, which also threatens their livelihood.

This threat to their traditional livelihoods formed the basis for development of a partnership with an environmental research unit. The catalyst was the concern of government environmental regulators about the sustainability of the marine ecosystem of the estuary, particularly the fish stocks – a concern which prompted marine authorities to attempt to restrict or even shut down traditional fishing activity on the estuary. The community required evidence to support their claim to pursue their livelihoods – that, in fact, their practices were sustainable.

Drawing on an already established relationship with the academics, a partnership evolved that included aspects of research, training, advocacy, institution-building and the facilitation of negotiations with government departments and agencies, in an ongoing effort to save the community's livelihood from the proposed restrictions and hence, deeper marginalisation. This relationship has now lasted 20 years, and during that time has developed substantially in terms of scope, depth and mode of engagement.

The issues of livelihoods, marginalisation and sustainability have formed a nexus that manifests in related sets of research, capacity development and intermediary actions. The partnership has taken a holistic approach towards livelihoods and sustainability, and the community itself has an interest in practising their livelihood in a sustainable manner.

For the academic partners, the case provided an example of environmental sustainability research that needs to accommodate both the technical imperatives of fisheries scientists seeking resource sustainability, and the social imperatives of the local community. A key point is that regulation is unlikely to be effective if it simply bans a livelihood activity – and the community must still somehow obtain food and a livelihood. A balance must therefore somehow be struck. The inevitability of this nexus is underscored by the observation that if only the technical imperatives are met, and (for example) the estuary is declared a no-take zone, the result will be the continuance of fishing (illegally). The case is thus an excellent example of how social and technical systems are inextricably intertwined.

The interaction has produced knowledge that has been used to defend the community's livelihood and to adapt it in the face of environmental sustainability pressures. Participation in the research activity was itself a direct contributor to the community's livelihood, as the research unit pays the fishers for the time spent as researchers (since they are unable to catch fish for their own use). Under pressure from a government agency responsible for marine and estuarine environmental sustainability, and also acknowledging the limitations of relying exclusively on fishing as a livelihood, over the years the partnership has explored alternative livelihood options, highlighting the complex relationships between livelihoods, land claims, marginalisation and the balance to be struck between human development and ecological sustainability.

Overall, this case demonstrates that interaction between informal sector innovation and its social and political context is important. The interaction between the fisher-research unit partnership and government actors is framed by long-term socio-political exclusion, and this marginalisation is a key driver of the interaction (a notion also expanded upon below).

Livelihoods, marginalisation and sustainability

We were trying to use this data to challenge government's ongoing desire to close the estuary, and saying look our figures are telling us that this resource ... is not under threat, that in fact this resource is – if we look at the figures over the time period of data that we have – it's sustainably harvested and we are not that concerned about it in the estuary.⁴²

42 From interview with research centre academic

We certainly are not interested in and neither are the fishers in the scenario where this estuary gets run down. This is their livelihood.⁴³

It's about how you set up conservation areas in a way that supports both conservation and people's livelihoods and doesn't totally undermine or jeopardise the livelihoods of people because you can't have a conservation area if people are totally dependent on that area, they will just harvest resources any way they have to.⁴⁴

They don't have clear alternatives and so what we have been exploring is some of the fishers are getting involved in crayfishing and they've got access to permits now. So that's relieving some of the pressure off the estuary and so we are busy working out a whole lot of alternative supplemental livelihood things and linking them to the land reform process with the fishers to try and meet some of the conservation concerns but at the same time recognised that what the conservationists are wanting is the sort of first prize, a pristine environment where there's no impact on the estuary.⁴⁵

In our parents' time, they fished for their livelihood, there wasn't a nature reserve. But they were guided by the older people. But as time has changed and the government came to be, there needed to be changes and that is how the various laws came to be. So today a fishermen can have a 45 metre net to fish. My father on the other hand would have four nets at a time. And there are a lot of other rules when it comes to fishing ...

In previous years there weren't laws etc. And us as fishermen we didn't understand that. So we needed an organisation like the university to explain to us what these things mean and how to use them. And that is how the relationship went, and that is how fishermen learnt. And today I can say we have monitors and in the past we never had that, but they are good people because they help us in understanding the number of fish then and now.⁴⁶

Overview of the interaction: a dynamic long-term partnership

The relationship between the university and the fisher community has lasted two decades, having started in 1993, which provides an opportunity to examine the evolving interaction and identify shifts and patterns over time. Sowman (2009) presents a detailed description of this progression, which frames the analysis that follows. The paper is a useful source of empirical detail, and also provides insight into the academic partner's view of the engagement's origins and progression over time. However, the paper is both an output of the engagement and a reflection upon it – which necessitated a degree of critical distance when using it as a resource for case study analysis, as well as triangulation with other sources of information, such as interviews, third-party websites and papers. We draw primarily on Sowman's (2009) delineation of three main 'periods' in the interaction.

The first phase, from 1993 to 1998, involved the initialisation of the relationship, the development of a research and co-operation agenda, and the establishment of the first platforms to be used in their joint negotiations with government authorities who were attempting to cut off access to their livelihoods. The second phase (1999–2004) involved the deepening of the relationship, and the involvement of other actors in the network. The current phase (2005 onwards) has seen increased transdisciplinarity, co-production of knowledge, the incorporation of indigenous knowledge systems (IKS) and mutual capacity development. The research agenda and approach has become more responsive and adaptive,

43 From interview with research centre academic

44 From interview with research centre academic

45 From interview with research centre academic

46 From interview with fishing community committee members

and the intermediary role of the research unit evolved from a focus on facilitation of negotiations towards a focus on advocacy. Thus, over time, we see changes in the types of research, knowledge flows and interaction, and more active community participation.

The interaction originated in 1993, when the fishers were concerned about the presence of diamond-trawling vessels anchoring in the mouth of the estuary, and suspected that these might be having an adverse effect on local fish stocks. They voiced their concern to an NGO operating in the community. The NGO had working links with the university, and became a critical intermediary in establishing the linkage. They approached the academics to conduct research to better understand the possible links between the presence of the vessels and the decline in fish stocks. On this basis, academics made their first trip to the fishing community.

Their research indicated that the diamond trawlers were not actually impacting on estuarine fish stocks, as they were not using the mouth of the river to recover diamonds. However, the initial interaction spurred further engagement, as the questions of fish stocks and livelihood sustainability remained:

So we said it's not matching up, but let's put in place a community-based monitoring system, get some data, and work with the fishers to try and better understand the nature of the fishing, the patterns, and the harvesting pressures, and let's get the community involved in equally understanding some of the possible issues. Then we started the whole series of workshops and there was also a capacity development component where we tried to work with the existing ad hoc fishing committee to try and set up something that was a little bit more robust.⁴⁷

After a preliminary assessment, the unit initiated a research project with the aim of assessing the sustainability of net-fishing, while in the process developing a community-based monitoring system. They aimed to develop a co-management system for the fishery, under which the provincial government department and the community would jointly manage the local fishing resource, sharing both rights and responsibilities. This agenda was agreed upon by both the community and the relevant provincial government agency. Thus, from the start, research, capacity development, political facilitation and advocacy were intertwined in the nexus of the engagement, with the main aim of sustaining the community's livelihood – both ecologically and politically.

The community-based monitoring system required the training of community members to monitor the fish stocks in the estuary by collecting data describing harder catches and by-catches.

Non-fishers were trained up to meet the fishers when they came back from their fishing trip and then we developed a catch return card where they will fill in where they went, what they harvested, how much they measured, they weighed and then that was the information that was then used to do this stock assessment.⁴⁸

Training took place both at the university and on site. Research commenced in 1994, and was supported by occasional visits from academics to monitor progress and discuss any problems arising. The stock assessment, undertaken from 1994 to 1997, did not reveal any decline in stocks (Sowman 2003, Carvalho et al. 2009). The research team therefore recommended that additional licences be awarded to the most needy fishers, and that the increased fishing activity be closely monitored for changes in stocks.

47 From interview with research centre academic

48 From interview with research centre academic

A separate stream of training activities focused on building the capacity of the community to engage directly with government agencies. Some of the committee members were brought to attend training sessions at the university, including basic organisational skills such as organising a committee, appointing a treasurer, keeping minutes and understanding co-management.

In parallel, research was conducted into the use of different mesh sizes and their influence on the nature of catches. The research resulted in the first livelihood benefits to the community, as the results were used to convince the authorities to allow a reduction in the legal mesh size, which increased catches without resulting in substantial additional strain to the ecosystem. This was the first example of how the interaction could render livelihood benefits, in the form of incremental changes to fishing practices.

Facilitation focused on the establishment of a co-management arrangement between the community and environmental authorities. This involved workshops for elected community members and the broader community to build an understanding of the co-management mechanism and to approve a partnership agreement. It also involved regular meetings with the provincial government agency to finalise the details of the agreement. By 1997 a draft partnership agreement had been formulated.

However, this newly built platform was undermined by political changes. A national overhaul of legal and regulatory systems resulted in responsibility for marine and estuarine management being removed from the provincial authority and placed in a directorate within the national department. Unlike the provincial authorities, the national authorities were far removed from the location and interests of the fishing community. During this move, there was a policy and reporting vacuum, as there was no clearly identified government partner with whom to engage. As a result, the co-management agreement collapsed.

This shift initiated what Sowman (2009) identifies as the second stage of the engagement. Scientists under the authority of the national directorate conducted research on the status of the harder resource along the South African coastline. Their results suggested that the resource was generally overexploited, and they recommended a reduction in the number of permit holders (Hutchings & Lamberth 2002). The fishers were informed of this decision at a community meeting, where they learned that the national department intended to substantially reduce the number of licences in the community.

At this stage the research, capacity building, and facilitation effects of the interaction enabled a critical defence of the community's access to their livelihood. The presence of a well-organised and well-informed fisher committee, backed up by sound research about stock levels in the area, prevented the government agency from imposing their 'scientific' decision unilaterally. Government actors were compelled to negotiate over fishery rights and management protocols. The outcome of these negotiations protected the fishers' livelihood, with approval for 90 fishing permits, and regulations governing net specifications and by-catches. The agreement is still in place today, despite several subsequent efforts to reduce fishing allowances.

BOX 5.1 *By-catches*

Although the research indicated that the harder resource was being sustainably fished, the issue of by-catch remained of concern. By-catch refers to fish caught in the nets that are not of the target species. In this instance the evidence revealed that the fishers were catching quantities of linefish, which are 'red-listed' and thus threatened species. This was particularly concerning as estuaries are breeding grounds for these species and a key part of their lifecycle. This issue raised difficulties in the negotiation process with authorities. In 2005 the government agency used the issue of by-catches as a basis for proposing to close the fishery.

In the face of the ongoing threat, the partnership focused on bolstering the community's capacity to defend their claim to livelihood. This included training measures to enhance awareness about fishers' legal rights and responsibilities and on developing the capacity to participate in co-operative management. This effort drew a new actors into the network. A research centre, funded through a Norwegian–South African bilateral agreement, based at another local research university, assisted with capacity development. In addition, a new round of meetings between the community and government agency was initiated.

The threat to their livelihood continued. Sowman (2003, 2009) and Carvalho et al. (2009) claim that the government agency continued to take decisions affecting the fishery without adequate consultation, despite several expressions of concern. Continued concerns about the status of linefish stocks lead to new rules, including restrictions of traditional net-fishing rights. The national department of Environmental Affairs and Tourism again unilaterally announced that fishing in the estuary would be phased out within 10 years. Again, the fishers, with the support of the research unit, opposed this move. Again, this drew in the NGO intermediary partner to assist with negotiations. The fishers expressed their support, and indeed their need, for sustainability, but opposed the move to shut down their livelihoods.

This tension initiated what Sowman (2009) identifies as the third and current phase in the partnership. At this point the engagement re-focused on research in order to contest the decisions of the government agency. By-catch monitoring was reinstated in 2004. The research unit also continued to facilitate attempts to entrench co-management between the fishers and government. However, the very different approaches of the actors involved lead to stagnant negotiations. The national government agency adopted a precautionary approach focused exclusively on resource management and sustainability, while the research unit and the fisher community aimed to balance these priorities with the livelihood needs of the community. These positions could not be reconciled, and the co-management arrangement was seen by the fishers to be 'a farce' (Sowman 2009: 128) in which the marine management agency de facto made all decisions.

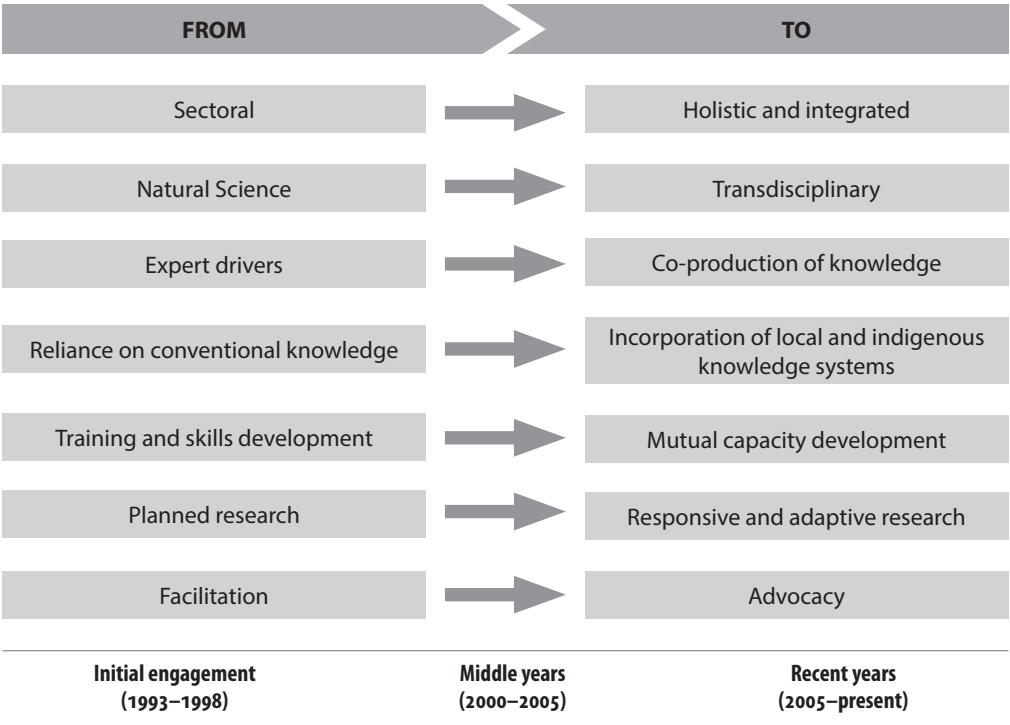
In 2007 this agency commissioned research from a private consultancy to develop a management plan for the estuary. The marginalisation of the fishing community was underscored by its omission from the report. The area was described as 'relatively unaffected by human development' and an 'unofficial wilderness sanctuary for flora, fauna and visitors' (Anchor Environmental Consulting 2008). Little reference was made to the human dimensions of the estuarine system in general or to the fisher communities in particular. This marginalisation was reflected in the recommendations of the report, which included proposals to declare a no-take Marine Protection Area (MPA) from the mouth of the river to 14 km upstream and the 'identification of alternative livelihoods' for the fisher community. The proposals for the fishers to 'find alternative livelihoods' were met with incredulity by both the community and academics:

In order to really explore this in any serious way you need to do feasibility studies, and so if you are talking about agriculture as an alternative that is probably a three-year study, which is about a million and half rand and we need Stellenbosch University or Elsenberg to go and do a study there, whereas the understanding from the government fishery scientist side is, oh, you can just identify something and then they can do agriculture or they can go and become farmers. They don't realise that a move, a shift in livelihood, is a like telling a doctor to become a lawyer, sorry you can't do doctoring anymore you have to be a lawyer. So we felt that the government scientists would take an extremely narrow and unrealistic approach.⁴⁹

49 From interview with research centre academic

The research unit changed its strategy from facilitation with government to a more adversarial stance. The fisher community, together with the research unit and the intermediary NGO partnered with the Legal Resources Centre in order to assert their legal rights and petition the government. This action led to a review of the proposed MPA. The nexus of research, facilitation and advocacy was key to identify the knowledge required to successfully challenge the proposed changes. A new research agenda was delineated. To gain evidence in support of the customary rights of the fishers, the partnership was expanded beyond the research unit’s disciplinary base to include partners from other academic disciplines, notably history.

FIGURE 5.1 *Evolution of the interaction 1993–2009*



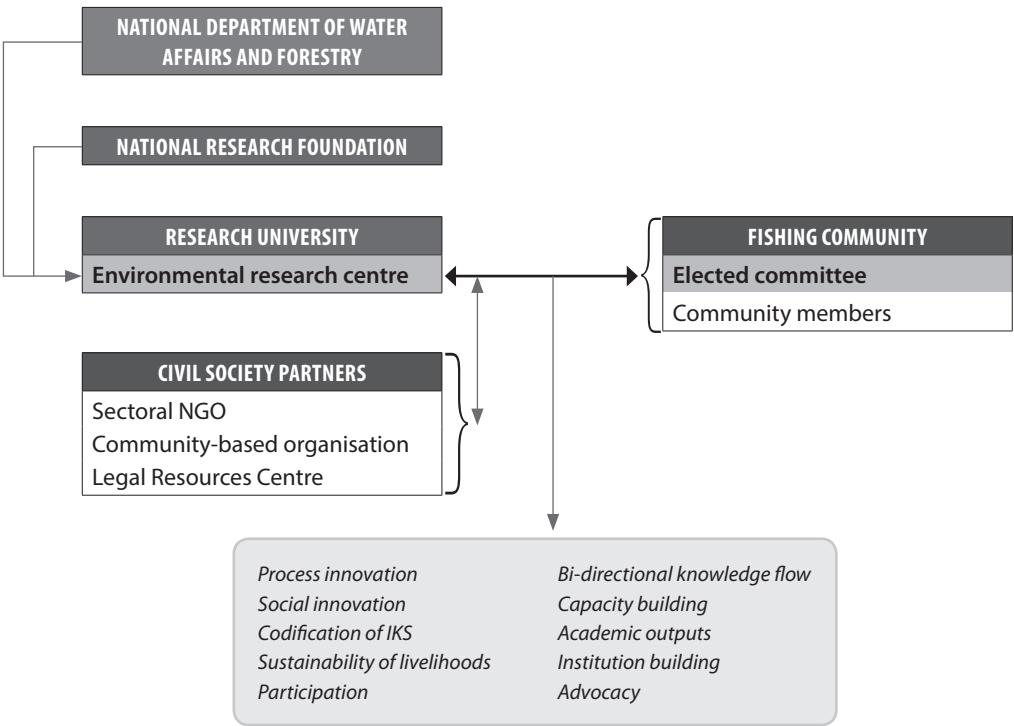
Source: Sowman 2009

The trajectory of the interaction over its entire history illustrates a move towards a more holistic, transdisciplinary, inclusive and responsive partnership, as proposed in Sowman (2009) and summed up graphically in Figure 5.1. Initially, the academics provided ‘expert’ advice to the community and built capacity to empower the community to participate in environmental management decisions. Such service forms of interaction are typical particularly in relation to communities driven by social imperatives. The focus shifted to collaborative research and co-production of knowledge to respond to policy changes. At the same time, the university partners extended their disciplinary scope to address the complex challenges facing the fishery. From this point, a network form of interaction began to evolve. Members of the fisher community increasingly exercised agency in the context of the project, contributing towards shaping the research agenda, defining the terms of interaction, and carrying out research.

The structure of interaction

Figure 5.2 provides a map of the actors involved in the interaction, as well as the flows of knowledge and resources, to orient the analysis of actors that follows.

FIGURE 5.2 Map of interactive partners: fishing community



The social partner: the fishing community

The location of the fishing community is on the banks of the estuary of a river on the West Coast of South Africa. This is one of the largest river estuaries in the country, hosting a unique and highly productive ecosystem. The estuary has been inhabited since pre-historic times, and evidence indicates that marine and estuarine resources were used during this time (Parkington 1977, Sowman 2003). The dependence of local inhabitants on fishing as their basic source of food is documented in archival records (Parkington 1977, Probart 1915, Reitz 1929).

The community largely consists of the descendants of families evicted from fertile agricultural land (Figure 5.3) in 1925, on the basis of discriminatory colonial policy. These families were ‘re-settled’ on the lower reaches of the river, near the estuary, in small hamlets. Since they were dispossessed of their agricultural land, they also lost their agricultural livelihood. Their proximity to the estuary prompted the community to change their subsistence activity from farming to fishing, drawing on the local knowledge of the smaller communities that were already based in the area:

The people were catching fish already here. In 1925, there were people already fishing here for 100 years. ... My father was born in 1914, and he grew up here. Then he says that the people have been living here from the eighteenth century already.⁵⁰

Since that time, and to the present day, the livelihood of the fishing community has depended on their catch of harders (a species of fish) using rowing boats and gillnets. This catch provides food for the community, and a small income as they sell excess fish to nearby farmers, particularly in summer when the catches are better, or take their catch to market in a nearby town. Another option is to use the harders as bait to catch crayfish. They also preserve fish by salting and drying. At present they do not have refrigeration, which would extend and stabilise this livelihood (although this itself might be problematic, as the core academic commented: '*Getting a cold storage facility encourages perhaps more fishing than one would want. So there's a self-regulatory thing going on with the lack of cold storage*').⁵¹ To supplement this livelihood, seasonal work is also taken on, for grape picking on nearby wine farms, or ad hoc employment such as road maintenance.

The fisher community is both small and poor, factors that contribute to their continued marginalisation. Approximately 150 families live on the estuary, although the community has been restricted to having only 45 fishing permits. As each permit holder may have one crew member, there are a total of 90 'legal' fishers (Sowman 2009). In interviews with community leaders it was reported that approximately 120 fishers, both legal and illegal, are currently fishing on the estuary. The families have a mean monthly income of R378–570 (US\$53–80) (Carvalho et al. 2009).

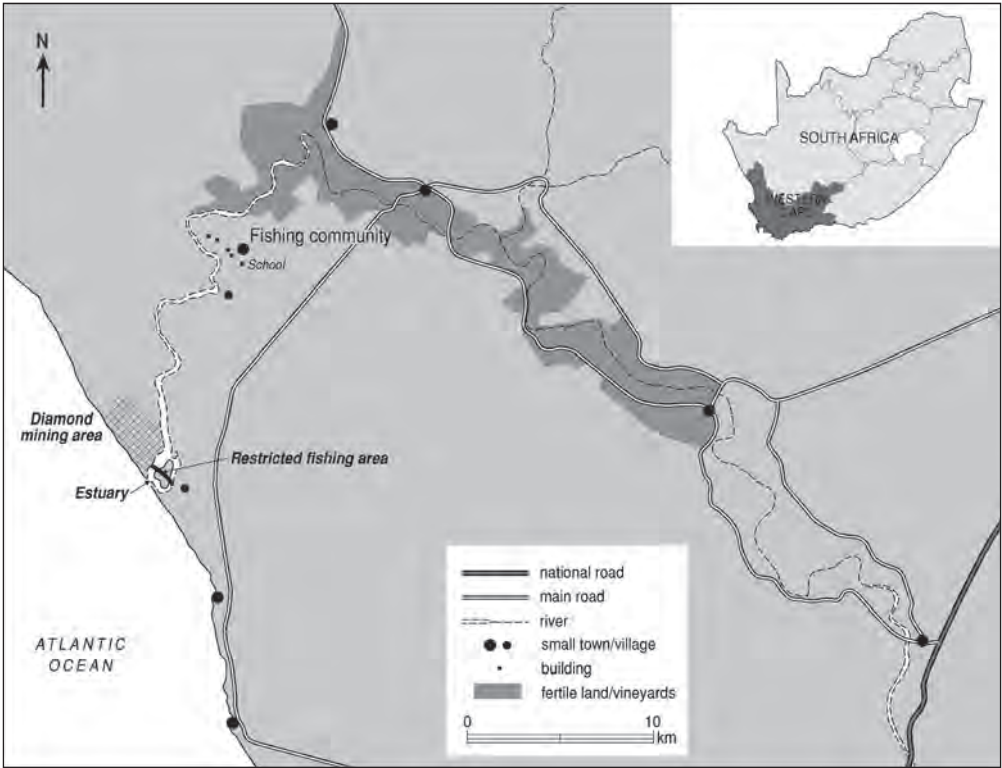
A site visit gave a clear sense of the isolation and marginalisation of the community. Departing from Cape Town, the 350 km drive passes through smaller and smaller settlements, until one reaches the tiny hamlets. The route passes by expanses of fertile land covered in irrigated vineyards – grown on land that was expropriated from the community and still belongs to (largely white) commercial farmers. The hamlet itself is poor but not deeply impoverished. A local Lutheran mission school, after which the village was named, has provided a higher quality basic education to the community than might have been received through a regular government school. All the houses are brick-and-mortar constructions, and there is no sign of informal or temporary housing. At the same time, there are no signs of economic activity beyond the basic livelihood of fishing and the occasional vegetable garden.

The fishing activities of the community are not conducted under any formal aegis – there are no legal entities or firms that coordinate either the primary economy activity (fishing) or the secondary economic activity (selling fish to nearby farmers and towns). There is no application of labour legislation, taxation or any related social entitlements. There is little or no linkage with formal value chains. However, global value chains in the fishing industry have to some extent played a role, as industrial-scale fishing off the South African coast has impacted on fish stocks to several orders of magnitude greater than that of traditional fishing communities.

50 From interview with the fishing community committee members

51 From interview with research centre academic

FIGURE 5.3 *The location of the estuary and its fishing communities*



NGO actors

An NGO works with fisher communities in the Western Cape and Northern Cape, based in Cape Town. It works with previously disadvantaged and traditional fishing communities who are dealing with the impact that the current fishery management regime has on the social, cultural and economic life in their communities. The organisation facilitates mobilisation and organisation of fishing communities at the grassroots level, in order for communities to become empowered and capable of taking part in political and economic decision-making processes. They also lobby for and advocate governmental policies that build on the principles of social and economic justice.

A national community-based organisation (CBO) emerged from this NGO in 2003. It is made up of leaders from fishing communities across South Africa, and has over 2 000 members. The organisation was established as a vehicle for small-scale fishers to secure their livelihoods and overall human rights. Its agenda has centred on campaigning for legislation that serves the interest of small-scale fishers, empowering people in the sector with skills and knowledge, promoting participative fishing governance arrangements, and protecting fishing resources.

The NGO played a key role, helping to establish the interaction in 1993 by connecting the community with the research unit, and acting as an intermediary in negotiations with government agencies throughout all periods.

The Legal Resources Centre is a human rights organisation, founded in 1979, that aims to use the law as an instrument of justice for the vulnerable and marginalised, including poor, homeless and landless people and communities who suffer discrimination. Their strategies to achieve this include impact litigation, law reform, participation in partnerships and development processes, education and networking.

The Legal Resources Centre partnered with the fishing community, the research unit and the fishing NGO in their negotiations with government agencies. In particular, they provided legal advice that was critical when challenging the legality of government decisions taken without community consultation.

The research university⁵²

In contrast to other South African universities, this university adopted the concept of 'social responsiveness', rather than notions of community engagement or outreach. Social responsiveness refers to an academic orientation towards key development challenges facing the country and the continent in a changing global environment. Social responsiveness is very broadly defined, but at its core should be an intentional public purpose or benefit.

It is well-resourced, research-focused university in South Africa. The university receives 40% of its income from private sources, and the remainder from shrinking proportions of government funds and growing proportions of student fees. The academic staff is highly qualified and experienced.

The research centre

The research centre is an independent, self-funded research, consulting and training unit, founded in 1985. The unit works in the areas of sustainable development and integrated environmental management, both in South Africa and internationally, using interdisciplinary and participatory approaches, with a wide range of partners. The unit may be characterised as 'boundary spanning' in that it is located within an academic department, but self-funding accords a degree of flexibility to shape its agenda and mode of operation. The research centre is thus well positioned to shape and respond to the university's social responsiveness imperative:

Social responsiveness is thus at the core of the research centre's mission and methodology, and we place strong emphasis on working with communities directly reliant on natural resources.⁵³

The research centre is involved in a number of projects related to this core mandate, some of which intersect with its work with the fishing community. This includes an international comparative project that aims to create an empirical and theoretical platform for improved understanding of fisheries governance frameworks and institutional arrangements in South Africa.

Government actors

Government actors are key protagonists driving the interaction at significant points.

Government departments at provincial and national levels operate within a changing legislative and policy framework that aims to shift past policies protecting local vested interests. Sowman (2009) highlights the main legal and policy frameworks governing marine and estuarine resource use by communities. In line with international practice, the concern is to protect coastal and marine areas, and restore depleted fish stocks. South Africa's marine and estuarine resources are primarily governed

⁵² Our overview of the research university and its social responsiveness orientation is drawn from Kruss et al. 2012: 87–105).

⁵³ Cited from research centre website

by the Marine Living Resources Act (No. 18 of 1998), which oversees the management of 20 MPAs in South Africa. MPAs have been promoted as the main tool to achieve ecological and fisheries management objectives, but also, to minimise user conflicts. MPAs are highly restrictive in terms of access to resources.

However, progressive legal provisions in other environmental statutes safeguard the rights of communities to share in the benefits of protected areas, to gain equitable access to resources (Integrated Coastal Management Act No. 24 of 2008; Marine Living Resources Act No. 18 of 1998) and, critically, to participate in the management of relevant resources (National Environmental Management Act No. 107 of 1998; Biodiversity Act No. 10 of 2004; Protected Areas Act No. 57 of 2003). A key piece of legislation is the National Environmental Management Act (NEMA) of 1998, which provides the overarching legal framework for environmental management. A binding principle for all organs of state is 'participation of all interested and affected parties in environmental governance, with appropriate capacity building that ensures equitable participation'. The NEMA also requires that civil society be included in environmental decision-making, embodied in Environmental Management Co-operation agreements to promote partnerships and the sharing of responsibilities and decision-making over natural resource management.

Historically, fisheries management was characterised by a top-down, science-based approach (Sowman 2009), but government actors now work within a policy framework that requires them to balance potentially conflicting goals of ecological management and equitable access.

Organisational arrangements and interface structures

Interface structures at the research university

In contrast to some comparable research universities in South Africa, which have highly structured formal systems to promote 'community engagement', the research university has adopted a more open and flexible approach based on advocacy and brokerage within the university. The aim was to define social responsiveness in a broad manner in order to allow for differing interpretations and to promote debate. This stems in part from the university's institutional culture of academic independence, which leads to academic opposition to 'interference' from government or university management. In order to avoid alienating academics through top-down or intrusive measures, a broad inclusive approach was developed. As one faculty representative who was involved in the formulation of this approach reported:

What is key is that the broad approach creates the most possibility for change, greater than if we exclude certain forms of responsiveness. (Kruss et al. 2012)

To create an enabling environment, university management established several new institutional structures and policy mechanisms.

There is a disadvantage to labelling things, in that academics build up resistance. So we try to diffuse these ideas, to make visible what is already there, in an attempt to get academics to do things differently. So they may get excited about what they are already doing. It's all about how you package it, without seeming like a new demand. This takes lots of legwork – talking, meetings, emails and is very labour intensive. (Kruss et al. 2012)

The process of developing new institutional structures proceeded slowly, beginning with committed champions and progressively becoming more structured and formalised. The main new structures are:

- Social responsiveness has been added to the portfolio of one of the deputy vice chancellors. This includes the disbursement of grant funding for strategic projects.
- A senate sub-committee on social responsiveness has been formed, constituted by faculty representatives (although they are not formally inserted into faculty reporting structures – the committee is comprised largely of individual ‘champions’).
- The responsibility to promote engagement was decentralised to deans as one aspect of their portfolio. Deans’ strategies were largely to strengthen existing activities through network-building and supporting nascent activities through access to funding.
- Direct operational responsibility was assigned to a small dedicated unit located within the institutional planning office, with a primary role of monitoring and promoting activity, brokering relationships, and working with individual champions of engagement.
- An annual publication showcases a selection of good practice cases together with academic reflection on shifting trends.
- An annual set of awards for social responsiveness was instituted.
- There has been increasing recognition of the importance of including social responsiveness in tenure and promotion criteria.

The interaction with the fishing community began long before these developments. It was not significantly affected, positively or negatively, by the changes in university policy and structures after 2007. In fact, the unit leader has been one of the academic champions of social responsiveness within the institution, contributing to the new policy and practice, by drawing on her experience with the fisher communities. This highlights the role of individual champions – the core academic involved in the interaction is a passionate believer in its cause, as well as an intellectual actor and beneficiary.

Academic voices on social responsiveness

One of the things we are doing as the social responsiveness committee is saying how do you value social responsiveness work or social engagement, how do you judge it, what's the metric, how do you measure it, how is it possible? ... I suppose as we all know when the university needs to pull out the social responsiveness banner then of course it's very important, but in general the bean-counting is around publications and around students, postgraduate students.⁵⁴

We don't in a sense have a place where there is virtual or physical [contact], we don't have a place where people doing this work or get together and meeting and talking. Everyone is just in their own little separate world doing their little bit of scholarly engagement or community outreach or whatever they call it, but there's a lot going on at the campus.⁵⁵

The role of the research centre as an intermediary

The research centre has played an important role as intermediary in the processes of innovation, as a catalyst for connections to other actors. They have also acted as interlocutors between ‘producers’ and ‘consumers’ of knowledge, for example reporting the findings of their scientific research back to the community. In other instances they have acted as intermediaries in the context of co-produced knowledge. Community participation in their research projects has often drawn on local and traditional knowledge, and the research centre has acted as a bridge to bring this knowledge together with scientific knowledge. Other intermediary actions include:

⁵⁴ From interview with research centre academic

⁵⁵ From interview with research centre academic

- Acting as a facilitator of discussions and negotiations between the fisher community and government actors. In this case, the different 'ways of knowing' of all the parties concerned necessitated ongoing efforts to foster communication.
- Catalysing new relationships with NGOs that provided additional types of support for the community.
- Establishing structures for the community to self-organise, for example the fishers committee. This has enabled the community to engage directly with other actors in a more effective manner.

The research centre has consistently been in close contact with the community, and at the same time, sought to embed their actions into larger systems. For example, establishing co-management arrangements through which the fishers committee could negotiate with government actors. These intermediary actions have been finely tuned to the absorptive capacities of the community. The training and capacity-building interventions were targeted within the specific context.

This intermediary role is seen as critical by community members as shown in the quotations that follow.

Systems of interaction

The research university does basically all our meetings, all interactions etc. with the government. They opened the doors for us to where we want to be. I have to give the university and our CBO their due as our fishermen are weak on our own, and to come to where they are will cost us money and we don't have money. For example if I am just going for a permit – that is to renew my permit – it's not worth while, but to engage, to really interact about the obstacles is very valuable.⁵⁶

We've always tried to play a ... facilitating role with the players and say look let's work together, let's meet, let's discuss, let's negotiate, let's try and find a way forward. Of course we've got the interest of conservation at heart. We all know we don't want to trash estuary; we don't want the fish to all be fished out.⁵⁷

So there'll be with the consultants [and] DAFF [Department of Agriculture, Forestry and Fisheries] and they will say things like 'okay well it [the protected area] doesn't have to be 18 kilometres we are willing to go down to 10' and then the fishers will just say 'no, we need to look at what this means, we need to look at who will be affected'. Then eventually at one of the meetings one of the conservation guys just walked out and said 'I don't care just make it 4 kilometres'. They were missing the point.⁵⁸

[Government and consultants] have adopted this very technocratic top-down science-based position which says 'we do the science, we manage the resources, you can't do this' ... Certainly at our university and in many universities in South Africa you go into the science degree and what you learn about your physics, biology, science and then ... suddenly become a manager and you're dealing with people resource interactions. Now where do you start? You don't even know. So there's this perception about, oh that soft science stuff or that human stuff. Our job is to manage our resources for future generations.⁵⁹

Community interface structures

One of the most significant outcomes of the interaction is the development of formal interface structures through which the community can engage with academic and government actors. Prior to the establishment of a formal fishers committee, there were informal social structures for dialogue and representation of the community. The formalisation of structures began with their interaction with the NGOs.

56 From interview with fishing community leader

57 From interview with research centre academic

58 From interview with research centre academic

59 From interview with research centre academic

In 1993, an ad hoc 'fishers committee' was established to represent the fishers and serve as a coordination and contact point in their engagement with the university. Rather than impose an entirely new structure, the university and the community worked together to evolve the informal structure into a formal one. The university provided training on organisational management, to move towards setting up a 'more robust' and long-term structure. This aim was achieved, as the fishers committee remains in existence and continues to be the primary structure for engaging with the university, while it has credibility in the community.

In addition, the fishers committee has become an important interface structure for interaction with government actors. The committee provides a forum for discussion and preparation for such interaction and mandates members to participate in the co-management forum with government actors.

Effective community interface structures have thus played an important role, central to the community's response to its livelihood challenges. These interface structures have also enabled other outcomes: the development of skills, the production of new knowledge, the successful response to threats to their livelihoods, and the capacity to draw on a variety of organisations and resources as required.

The fishing community and interaction with fisher-community-oriented NGOs

In the past we as fishermen had two committees, that is the fishermen on the river had their own committee, and the other was for fishermen on the sea. And then at one point, the fishermen did an enquiry for quotas and through this a lot of fishermen were left out. And then an organisation approached us ... and from this the fishing NGO was born. And this organisation looked at the fishing communities' problems. For example, it looked at the quota system and those fishermen that were disadvantaged. And then out of the NGO another organisation was born, the fishing CBO [community-based organisation]. It is made up of the leaders of the fishing community. And in 2007 we became one.⁶⁰

Then [in 1993] we started the whole series of workshops and there was also a capacity-development component where we tried to work with the existing ad hoc fishing committee to try and set up something that was a little bit more robust.⁶¹

Drivers of interaction

From the community's point of view, the core driver of interaction is the maintenance and sustainability of their livelihood. This overarching proactive and long-term goal includes several component drivers, manifested in different aspects of research, training, facilitation and advocacy. These include the need for new knowledge to underpin their claim to sustainability, the need for new skills and capabilities to adequately engage with government authorities, and the need to alter the technologies and resource balances of their livelihoods to ensure continued sustainability. There are thus aspects driving the interaction on the community side that could be described as 'passive' as well as 'proactive', 'financial' as well as 'intellectual'.

The short-term reactions to (occasionally ad hoc) changes in regulation are often 'passive', with short-term objectives, largely driven by immediate livelihood concerns. The more strategic and long-term objectives require knowledge and skills, which act as core drivers for the ongoing relationship and its overarching aims. From the community's point of view, the origins of the relationship lie in a 'passive' strategy, initiated in response to a short-term problem. Over time, the nature of the relationship took

⁶⁰ From interview with committee members

⁶¹ From interview with research centre academic

on a more 'proactive' character, to improve their livelihoods through research and training. Another aim is to overcome marginalisation more broadly, including gaining recognition for the community's traditional and local knowledge. The community aims to draw in the university research unit to help broker a positive relationship with intermittently hostile government authorities while adhering to current regulations.

Community voices on the drivers of interaction

*The information that they have given us has enabled us to gain a better living from fishing. That is by knowing what fish to take out and what not to.*⁶²

*They are helping us with the laws, by making sure that we are keeping to the laws and what we are allowed to fish and what we are not.*⁶³

*It was one of our biggest concerns – that our history and culture as well as our knowledge wasn't acknowledged, especially by government.*⁶⁴

*[The research and training sessions] gave our fishermen knowledge about how to protect the river and how to preserve the river for the next generation.*⁶⁵

From the university's point of view, the main drivers are intellectual and social imperatives. The interaction has been challenged by a shortage of financial support, but has provided plentiful subject matter for academic work and for the identification of dissertation projects for postgraduate students. The research process has included students from a diverse set of disciplines across the university, including history, indigenous knowledge systems, environmental and geographical science, fishery science, law, and others.

However, overall it seems that the main driver is social conscience: a desire for the unit's research and engagement to have a positive social impact. The unit's social agenda includes a stance in defence of marginalised fishing communities threatened by legislation that is often in favour of powerful actors, including large fishing firms, while ignoring or sidelining the small and poor communities traditionally dependent on marine resources.

Academic voices on the drivers of interaction

*Our argument has always been well if you want to manage fish and if you want to have sustainability of your resources you have to take a holistic approach. You can't just look at the fishery. If you want to take pressure off the fishery you've got to look at alternative livelihoods, you must work with local economic developments, you must work with other resource areas.*⁶⁶

We are working on another project on developing guidelines for all the marine protected areas in South Africa, because marine protected area conservatives and officials are realising that they just can't get on top of the poaching problem. What they are saying is we declared these areas and people are just poaching and all we are doing is trying to catch people and fine them and put them in jail. One of our PhD students has been involved in an interesting case where a fisherman in a marine protected area was

62 From interview with community leader

63 From interview with community leader

64 From interview with community leader

65 From interview with community leader

66 From interview with research centre academic

*arrested and we approached the legal resource centre and they represented him to say this guy has got a customary right because he's living in the Transkei system where they're very much involved in customary guidance systems, so that's underway at the moment.*⁶⁷

Innovation

Innovation resulting from the interaction primarily takes the form of 'social' innovation, but also very limited technical change. Research has contributed to the fisher community's understanding of species and the potential impacts of their fishing practices, leading to minor adjustments. The research on net mesh sizes led to the use of different nets that enhanced productivity without negative environmental impact.

Social innovation is evident in changes in the organisation of livelihood activity:

- Increased fishing for rock lobster in the sea rather than harder in the estuary
- The formation and strengthening of a committee to represent fishers and coordinate their activity
- Increased capacity in the community to engage with government actors regarding their livelihoods and participate in formal and democratic processes
- Strategic and operational support for a land-claim process instituted by the community
- The codification of traditional and local knowledge.

The 'new' social formations are an adaptation and strengthening of previously established structures. The changing balance of resource use, shifting towards rock lobster in order to decrease pressure on the estuary, is also an extension and adaption of a previous practice.

The innovation is thus primarily 'social', in the sense of being 'socially oriented' (Soares et al. 2008) in terms of the problem-solving goal and its connection to the marginalised community. In other words, the innovation has not been oriented towards 'marketability' but directly at livelihoods per se. The innovation is also primarily 'social' as opposed to 'physical' (as expressed by Nelson & Sampat 2001). The changes that have been brought about by the interaction have been, to some extent, 'innovations in organisational forms and business models that accompany a change in physical technology' (Cozzens & Sutz 2012: 21). In this broad sense, innovation has occurred within a 'sociotechnical system' (e.g. as expressed by Bijker et al. 1987) rather than an isolated classical innovation system.

The interaction is similar to the 'grassroots' innovation concept of the ProLInova group in the Netherlands: 'The focus is on recognising the dynamics of indigenous knowledge and enhancing capacities of farmers (including forest dwellers, pastoralists and fisherfolk) to adjust to change – to develop their own site-appropriate systems and institutions of resource management so as to gain food security, sustain their livelihoods and safeguard the environment' (prolinova.net, quoted in Cozzens & Sutz 2012: 22).

It is clear that the 'newness' of the innovation is marginal at best, and is in all cases 'new to the community' rather than new in any broader sense. Importantly, this 'newness' has far broader scope in the academic outputs of the project, in which the research and interaction have provided empirical and theoretical grounds for a considerable body of new ideas and academic outputs. However, this is not 'innovation' per se.

The innovation is largely non-technical, and does not involve technology transfer or diffusion. This is not an example of technologies from outside the community being brought in and adapted to local use.

67 From interview with research centre academic

Rather, this is a case of interaction with the university becoming a catalyst for local adaptation of social structures and livelihoods activities.

However, this does not imply that the innovation has not made a substantial contribution towards addressing livelihoods problems. On the contrary – the social innovations have played a key role in enabling the community to practise sustainable livelihoods and defend their livelihoods from external threats. It is conceivable that without these ‘innovations’ the community, as a whole, could have lost access to their fishing livelihood and been left destitute and vulnerable.

Knowledge and skills

The knowledge content (and learning) for innovation is based on two main platforms: the knowledge gained through research, and the knowledge gained through training and capacity development. The community has learned research skills, organisational skills, negotiation skills and technical knowledge of the sustainability of their own livelihood. This has not been undertaken through any overarching plan, but in an ad hoc manner as required by the different demands and objectives of the partnership.

Knowledge flows have had a bi-directional component, in that some elements of local and traditional knowledge have been incorporated into the research process and used to inform scientifically constructed knowledge. Along the axis of tacit/codified knowledge, this has usually involved the codification of tacit knowledge. Other knowledge flows have been uni-directional, with scientific knowledge and strategic knowledge being passed from the university to the community. This has largely been in the form of codified knowledge.

Regarding the level of knowledge intensity, it has largely been non-intensive. Knowledge generation and application has in most instances been directed at relatively simple social and technical changes. The most knowledge-intensive aspect of the engagement has been its utility as a case study to grow an academic field and its role in informing postgraduate research.

In terms of the hierarchy of knowledge exchanges along the vertical/horizontal dimension, the exchanges could be seen to be largely horizontal, with some vertical elements. The academics usually interact directly with community members without acting through vertical structures such as chains of reporting. The committee acts as a vertical knowledge channel to the rest of the community. This essentially horizontal structure includes a wide net of community participants. The fishers committee is elected through an inclusive democratic process that involves all the fishers in the community. The committee, in turn, feeds knowledge and information about strategic action back to its constituents.

Knowledge, skills, and capacity development

I received tremendous training from the university. With the information that they gave us, as fishermen, I was able to take the parts that were important to me and that was the more important thing for me. Gaining this information allowed us to monitor what we were doing – a good monitoring system. We have the data at our disposal – such as when it is breeding time etc. The university provided the individuals that do the monitoring, with experience and training – which they weren't aware of – and this is the one of the good things.⁶⁸

68 From interview with community leader

[The university learned from] our local knowledge and experience. Because the university knows about our experience and knowledge – that is our methods, our tools, etc. And we taught them all of these things.⁶⁹

We, through our engagement with this community, have learnt so much that it has influenced and shaped our thinking and certainly moved us to recognition of the value of [both] the disciplinary work and different perspectives.⁷⁰

This is how we began to build the relationship – which grew stronger and stronger. They did a lot of adjustments to protect the fishermen. Such as research about the harders – and indicated that the river had a sufficient amount for us to fish. And that there are two types of harders in the river – which we did not know. And this was important because we needed to monitor what fish we were taking and use a specific method to catch the correct one. This is just some of the things that the fishermen learnt.

We have constantly tried to support the fishers in providing the data, in responding to day-to-day issues, in responding to letters from government or threats, but what has been very interesting for us over the course of the project is that the fishers themselves now as a committee are able to respond to government. They are themselves able to write the letters. They might bounce it off on us but it's not us phoning them saying, we will write a letter, this is the letter we are going to write, are you happy with it.⁷¹

Through our involvement and through some level of enhanced capacity and understanding of their rights in terms of the new policies and the constitution ... because we've done quite a lot of work with them on looking at human rights, fishers' rights, what people's rights are in terms of the constitution and the fishers policies in the new Marine Living Resources Act ... fishers were in a better position to challenge government to, to basically say look, you can't just close fisheries, it's our livelihood.⁷²

Our people have years of experience already which they learnt from their forefathers. But now through the relationship with the university our people are learning more, because they are in a learning phase. For example about the boats. So you don't only stand by what you were, but you add to that.⁷³

We wanted to engage and we wanted to hear from the fishers at the meetings; tell us about your knowledge of this estuary, tell us about your needs, how you engage with this estuary, tell us about your history.⁷⁴

Community participation

Community participation has been central. The community plays a role in problem identification, ranging from the initial concern through most of the other problems that have been the focus of interaction. In terms of idea generation, there has been some degree of participation, but this has not taken place in all aspects. Strategic advice has often been generated by the academic partners and received by the community partners, as have most of the ideas for the generation of scientific knowledge. Community members have had some input though, flowing through the forum of the fishers committee and their role as research participants and co-producers of knowledge on fishing stocks. Most significant, perhaps, is the role that community participation has played in supporting the longevity and stability of the interaction. The participation of community members has led to strong buy-in and ongoing interest in sustaining the network and strengthened the knowledge component.

69 From interview with community leader

70 From interview with research centre academic

71 From interview with research centre academic

72 From interview with research centre academic

73 From interview with fishing committee members

74 From interview with research centre academic

Outcomes and benefits

The benefits of the project have largely been in the form of broadly observable change outcomes, rather than specifically measurable outputs (Table 5.1). This is due to the social nature of the innovation, and the central capacity-building and facilitation functions. Nonetheless, the positive outcomes are substantial. The direct outputs of benefit to the community include income earned from research work, new and more sustainable fishing methods, and training and capacity-building activities. Outcomes include improved sustainability of their livelihood, successfully negotiated agreements with government actors, improved capacity to negotiate with these actors, support for the community's land claim, increased legal knowledge, and the codification of the community's local knowledge.

TABLE 5.1 *Outcomes and benefits of interaction between the research university and the fishing community*

	<i>Fishing community actors</i>	<i>Research university actors</i>
Outputs	Income earned directly from research work	Academic papers, conference presentations, and research partnerships
	New fishing methods	
	Training and capacity-building activities	
Outcomes	Improved sustainability of livelihoods	Novel contributions to the academic field
	Negotiated agreements with government actors that allowed for continued fishing licences	Growth in the transdisciplinary scope of research
	Research skills development	Involvement of postgraduate students, including dissertation projects, from a diverse set of disciplines, including history, indigenous knowledge systems, environmental and geographical science, fishery science, law, and others
	Organisational skills development	Access to local and traditional knowledge sources in the community to contribute to research and knowledge
	Overcome marginalisation by government actors Improved capacity to engage with government	Contribute to debate and theory development/Increased research capacity – empirical and theoretical
	Support for community land claim	Improved multidisciplinary understanding of the social and environmental aspects of estuarine management
	Increased community knowledge of the law relevant to their livelihood	
	Codification of IKS	
	Increased capacity to participate in environmental management processes	
	Increased capacity for participation in research at the community level	

The direct outputs of benefit to the university are primarily the generation of academic outputs such as papers, conference presentations, dissertations and research partnerships. These have made a substantial intellectual contribution to the field of fisheries management. The theoretical contribution includes development of an interdisciplinary and 'holistic' approach towards marine and estuarine management, which goes beyond the narrow sustainability parameters of fisheries science to encompass social dynamics into an overarching understanding of socio-environmental systems. Such knowledge feeds into the broader research agenda of marine and coastal management that sustainably balances the human and ecological dimensions.

Positive outcomes include increased research capacity, and increased capacity for community participation in research and environmental management.

For the university partners the interaction has been a source of financial loss, and they have at times had to draw on departmental funds in order to sustain the relationship. External funding sources have been small and intermittent, which has exacerbated this challenge. At the same time, there has not been any concrete institutional support in terms of the social responsiveness policy.

Our engagement with them has also been dependent on the funding we had available. So it's not been that we've been working with them on an intimate basis for 18 years, but we have an ongoing relationship with them, and as things crop up they'll call and say 'look we got a big problem can you come and help or we need to work with you on this issue' ... So we have two years of data and then the money would run out for the monitoring programme and then maybe two years later we get it up and running again and we did two more years of data ... We've had an NRF (National Research Foundation) grant and then we've had a Norwegian grant and then nothing for a year. But during those years we've always just borrowed from other projects.⁷⁵

In terms of scaling up and diffusion, there is limited potential. There is no desire to 'scale-up' fishing activity as its scale is inherently limited by the sustainability thresholds of the estuary. The specific instances of change are relevant to the local context, but not beyond. Some of the core elements of the interaction may be broadly replicable: the manner in which skills and capacity development were used to empower the community. The replication of the process may be more important than the replication of the results. However, the potential reach of the improved multidisciplinary approach that includes the social and environmental aspects of estuarine management is significant.

Conclusion

The case provides the example of an interaction centred around social innovation that has served to protect the livelihoods of the fishing community, in an indirect manner. The fisher community has remained in its traditional home and continues to survive. Members of the community are increasingly skilled in adapting to environmental and policy challenges, and representing their interests in negotiation with government and scientific authority. Although the direct reach is limited to the very small community of fishers, over 20 years, the interaction has contributed significantly to produce research graduates and the academic field, and impacts potentially on government marine management through the creation of academically rigorous participatory approaches that balance ecological and human development needs.

75 From interview with research centre academic

Enablers and constraints

A core enabler of the interaction has been the ongoing commitment of the core academic actors – primarily driven by a social commitment, linked to the belief that the engaged research activity renders an important social and intellectual good for both the community and the university.

The conditions that facilitated the interaction are thus primarily informal, ad hoc, unstructured, centred on organisations and individuals with a social justice orientation, and the privileging of mutual learning processes:

- The leadership of sectoral NGOs that have a strategic, proactive approach to organising small fishers, in the form of nascent fishers committees
- The brokerage role of sectoral NGOs in connecting the community with the appropriate university expertise
- The expertise and support role of legal NGOs providing collaborative assistance in mobilising against government-imposed fishing restrictions
- The flexibility of the research centre as a department-based interface structure
- The orientation of the lead academic to social justice, participative research and community capacity development, facilitated by the university's institutional culture, but not actively supported by institutional funding, structures or mechanisms
- The academic utility of the research outputs, in terms of publications and conference presentations, as well as the outcomes, in terms of the intellectual contribution to the field, motivated for ongoing interaction
- The multidisciplinary nature of the academic interaction brought students and academics from several faculties of the university into the ambit of the project, which strengthened the intellectual scope and contribution
- The value of bi-directional knowledge transfer, in which tacit local and traditional knowledge is codified and transferred to the university actors, however limited in scale
- The core activities of capacity building, intermediary action, research and social innovation that complement each other in a reflexive manner, developed over time in response to community demand and as strategic responses to livelihood challenges
- The focus on building community interface structures, with the formalisation of a representative committee as a focal point for interaction, and as a structured interface with government actors
- The depth of community participation (involvement in problem identification, and idea generation) contributes towards the long-term sustainability of the engagement, as well as making a contribution to the knowledge and strategic components
- The long-time span of interaction is in itself an enabler, as it has created a trusting and mutually beneficial space for interaction.

Constraints and blockages primarily relate to the fact that although the livelihoods of the community have been protected thus far, the threat of further marginalisation remains constant:

- A shortage of funding and an intermittent funding stream. The interaction has absorbed internal university funds rather than catalysed an inflow of external funding
- The physical marginalisation of the community in an isolated location far from the university and government departments
- The possibility of tensions between the community and the research centre
- The shift from provincial to national authorities with differing policy priorities
- The lack of recognition of the lived reality of the fisher communities on the part of national government and its scientific consultants, evident in mutually incompatible paradigms for viewing sustainability issues.

Re-introducing indigenous cattle breeds to improve rural livelihoods at a rural university

Pastoral livelihoods in rural South Africa: a critical resource for marginalised communities

For centuries, traditional livelihoods in South Africa were primarily based on pastoralism. This has remained the case in many rural areas, where a large proportion of the country's poor and marginalised communities continue to practise cattle rearing as part of their subsistence and trade economies. For these communities, improvements to their cattle farming methods can provide much-needed livelihood support. Cattle are not only useful as sources of subsistence and trade, they are traditionally also a physical and symbolic store of wealth. In difficult times, cattle can be sold to generate cash flow to sustain a household or community – the project manager described cattle as a 'walking bank'.

Over time, some elements of traditional livelihoods have been lost through interaction with other knowledge systems and cattle breeds. One of these elements is the widespread loss of the genetic stock of indigenous cattle, a hardy local breed that was well adapted to the resource-poor conditions that characterise these rural settings. Interbreeding and the adoption of other breeds over time lead to the use of genetically 'non-descript' cattle, which are less well adapted, leading to low yields and poor quality.

The indigenous cattle project was born out of a desire to respond to this situation and to improve the genetic stock of rural cattle herds, in order to improve the livelihood prospects of these marginalised communities. The project originated at the rural university, but has since been replicated in other parts of the country. The national scope currently includes activities based at five universities that manage operations in seven of South Africa's nine provinces. In each hub, centred around a university, academics collaborate with the provincial Department of Agriculture, the Industrial Development Corporation (IDC), and groups of cattle farmers to introduce indigenous cattle breeds to their communities.

In the Eastern Cape province, the rural university forms the intellectual and operational hub of the project, and has initiated activities in 72 committees of farmers. This chapter focuses on the interaction between the rural university and participating co-operatives in the locality. The university also plays an important role at a national level, as the developer of the concept for the entire project.

The broad aims of the indigenous cattle co-operatives are rural development, knowledge generation and human resource development:

So the idea was that the indigenous cattle project would be used as a driver also to look at other developmental issues such as community capacitation in terms of development, because in the project the communities should come up with their own constitution, some draft agreements, appoint their manager of the livestock, and then get that percent trade. So, the idea was to say, you see it will bring just a heritage kind of breed, also to say how can it be used to empower communities in terms of development and it was also hoped that the communities will be able to produce to sell.⁷⁶

The long-term potential of the project is significant. There are approximately two million cattle in the former homelands of the Eastern Cape, and replacing just a fraction of these with indigenous cattle could have a large impact on livelihoods (Burgess 2007).

Overview of the interaction: a long-term partnership to reclaim indigenous cattle breeds for rural farmers

The origins of the project lie in the early 1990s (Burgess 2007). The dean of the Faculty of Science and Agriculture recognised the unique economic value of the breed, and saw this as a possible tool to promote sustainable agricultural development amongst the communal small-scale farmers living around the university. In 1992 he began to approach potential funders and partners with a plan to develop 'a link between commercial and communal farmers, whereby registered nucleus herds would be introduced to communal areas with the aim to upgrade existing communal herds to registered indigenous herds, thereby allowing communal farmers to become bona fide breeders' (Burgess 2007: 1). In 1994 a pilot project was launched with Norwegian funding, located in two communities near the small rural town in which the university is located. In the late 1990s the project attracted funding from the Development Bank of Southern Africa (now the Industrial Development Corporation), the provincial Department of Agriculture, as well as a private British donor.

The principles and goals of the project were based on a self-generating model borrowed from a post-Second World War development initiative known as the International Heifer Project. Faced with extreme poverty after the war, households in Europe received a donation of pregnant heifers on the basis that they in turn were expected to donate their first calf to another household. The model is particularly appropriate as it bears strong cultural resemblance to the traditional isiXhosa practice of cattle-lending, known as 'inqoma', by which female animals are lent to marginalised community members and later, after reproducing, are returned to their original owners.

The university – acting as the driver of the project – therefore donates ten registered pregnant heifers and two bulls to each community, which in turn is expected to pass on the same number of cattle to another community, after five years. The community enters into a contractual agreement with the university, binding it to recognised management systems that will allow for indigenous cattle offspring to qualify for registration to the breed. The cattle are sourced from a provincial breeders' club, a non-profit association of commercial indigenous cattle farmers.

76 From interview with the project leader

Communal farmers are organised into community trusts and are regularly visited by members of the Faculty of Science and Agriculture and mentors from the breeders' club, to support them in the transformation of their herds. The breeders' club has trained young livestock managers in the communities to become indigenous cattle breed inspectors, in the context of a formal agreement stipulating communal farmer obligations, and the existence of established local knowledge concerning cattle farming.

The project in its present form was formally launched in 2003. The first nucleus herds were delivered in 2004 to 13 communities. By 2010, 66 communities in the Eastern Cape had benefited, accounting for over 1 000 head of indigenous cattle. By 2013 this had grown to 72 communities.⁷⁷ Interviews with the project leader and project manager could not determine the extent to which the aim of 'regifting' has been achieved, but the project manager estimated that after rolling out the project in about 70 communities, approximately 20 have 'passed on the gift'.

Official records do not reflect the national scale of the projects rolled out in each province. An indication can be gleaned from the various project reports. For example, the North West project reported in 2013 that the project had distributed 1 272 cows, of which 144 were returned for redistribution (North West Provincial Government 2013). In Limpopo where the project was initiated in 2006 (allocating 30 pregnant heifers and 1 bull), a total of 512 animals were distributed amongst 16 farmers by 2013. Farmers were targeted from those who were recipients of land distribution and rural development grants in the province (Mojapelo 2013).

Funding from the IDC was depleted in 2010/11 and was extended by another two years, ending in the 2013/14 financial year.⁷⁸ Accordingly, at the time of research, a commercialisation strategy for each of the provincial nodes of the project was being developed for presentation to the IDC. Another funding source is the provincial Department of Agriculture, which matches IDC funding on a rand-for-rand basis.⁷⁹ This additional funding stream only opened in 2012.

The project has potential links to formal markets: once the new cattle reproduce, farmers have the option to sell them at auction or to abattoirs. The project leader has attempted to raise corporate interest. The Kellogg Foundation donated funds for research into the marketability of indigenous beef cattle with an emphasis on meat yield, including tenderness, flavour, colour and health benefits. There are plans to market hides as luxury items, and negotiations have been undertaken with an automotive firm that has shown an interest in using the hides in exported vehicles.

The empirical focus of our case study fieldwork was one particular community that had established a co-operative and, in this way, become participants in the project. These farmers were interviewed collectively – literally in the field. According to their account, they joined the project in 2012, receiving 18 cattle in March of that year, including 16 heifers (of which 6 were pregnant) and 2 bulls.

The structure of interaction

The indigenous cattle co-operatives project operates on a national scale, while the locus of interaction between the university and its surrounding communities is on a provincial scale. At the national level, coordination and funding are managed by the IDC. At the provincial level, each hub operates independently, as a non-profit trust steered by a Board of Governors that includes representatives

⁷⁷ From interview with project leader

⁷⁸ From interview with project manager

⁷⁹ From interview with project manager

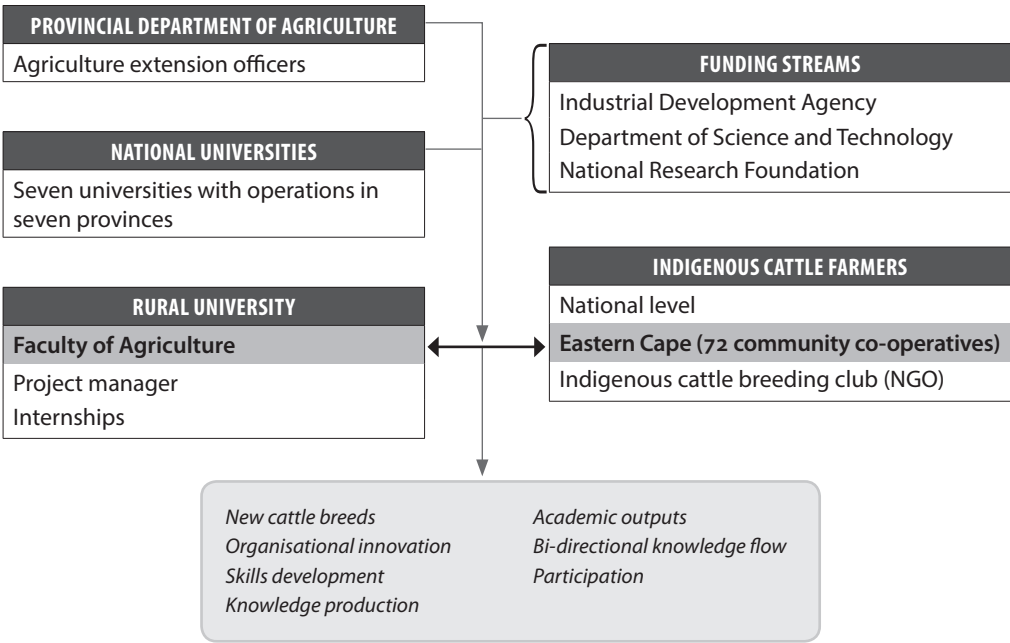
from the university, the provincial Department of Agriculture, farmers and the IDC. The IDC provides a funding and linking intermediary function.⁸⁰ Funding, governance and coordination functions rest in the Board of Governors. The university acts as a hub for project management, and also provides skills and knowledge at the interface with communities. The provincial Department of Agriculture provides operational support such as fencing, agricultural advisory support, and veterinary services to farmers through its extension officers, sometimes in collaboration with interns or field officers from the university. Communities are organised into co-operatives, each of which forms a distinct group and the unit of interaction with the other actors. The Trust (overseen by the Board of Governors) employs and pays for administrators and field officers that are based at the university. Field officers are the primary point of contact between the university and the communities, particularly with regard to training and administration.

Prospective farmers are usually introduced to the project through their local agricultural extension officers, who offer assistance in the application process. Applications are made to the project manager, who is an academic in the university. Once approved at this level, applications are forwarded to the Board of Governors, which makes a final recommendation for approval. Once funding is approved and the cattle procured, the new indigenous cattle breed consisting of 10 heifers and 2 bulls is usually isolated in a separate camp. The villages concerned are encouraged to get rid of any bulls in their herd that are genetically ‘non-descript’ (i.e. have no known genetic profile).

The rural university has a more prominent intellectual and organisational role than other universities, as it played a role in the origins of the project and continues to provide intellectual leadership.

Figure 6.1 provides a map of the actors involved in the interaction, as well as the flows of knowledge and resources.

FIGURE 6.1 Map of interactive partners: indigenous cattle co-operatives



80 From interview with project manager

The social partner: cattle farmers' co-operatives

The social partners are locally organised groups of cattle farmers, largely from poor, isolated, marginalised rural communities that practise subsistence agriculture and pastoralism in the context of limited resources, limited land and limited access to public services.

As an alternative to the community co-operative structure, emerging farmers that have benefited from land redistribution are targeted. The success rate among these emerging farmers is reportedly higher than among community co-operatives, because they have better existing infrastructure, are better organised, and are less hampered by group dynamics and micro-politics.⁸¹

Selection criteria vary between the provincial schemes. In North West, for instance, criteria include at least 350 hectares of fenced grazing land and certified proof of land ownership. In Limpopo, criteria include experience in 'cattle ranching', sufficient grazing capacity, existing infrastructure capacities and 'institutional and organizational development in terms of inclusiveness (gender, youth) and their contribution to poverty alleviation' (Mojapelo 2013).

In the specific case of the community co-operative interviewed, farmers were introduced to the project in 2007 by provincial agricultural extension officers in the course of their regular interaction. The extension officers assisted them with the application to join the project – but this came to fruition only in 2012. There are 25 people from the community involved in the project, including three women. The majority is older members of the community – the younger members have largely left for urban centres to find employment.

The higher education institution

Chapter Three described how the university has a long history of engagement with surrounding communities, with the objective of socio-economic development. We identified the prevailing development-oriented service pattern of interaction, of which the indigenous cattle project is an exemplar.

The School of Agriculture facilitates the involvement of the academics, field officers, students and interns, the majority of whom are their graduates. Other departments in the university are also involved, primarily through the use of the project as a site for postgraduate research from, for example, the departments of Life and Physical Sciences, Agricultural Economics and Extension Services, and Communication.

Government actors

The provincial Department of Agriculture and Land Affairs

The provincial Department of Agriculture has a mandate for rural development with respect to land use and agricultural development. Operationally, the department provides infrastructure, agricultural extension services and the monitoring of projects in all recipient indigenous cattle farmer co-operatives, through its extension officers. The department conducts training with farmers on how the indigenous breed and the local non-descript cattle breeds should be tended. Since the department has substantial experience in the area, it is usually well positioned to understand co-operative needs and farming practices. This training is sometimes conducted in collaboration with the field officers and interns.

81 From interview with project manager

The Industrial Development Corporation

The IDC is a public intermediary agency mandated by government to develop industry in various sectors, by identifying business ventures that have potential for employment creation and poverty alleviation. They then facilitate funding and procurement of infrastructure. The long-term interest of the IDC is to develop a global niche market for organically produced indigenous beef, given that the traditional farming methods of these small-scale communities are in effect free range and do not use chemicals. At the same time, the aim is to empower subsistence farmers and address poverty.

The IDC funds all the projects nationally. It also provides a coordinating mechanism: each year it hosts an annual meeting of project managers and chairpersons of the board of governors from each of the provincial hubs.

Technology Innovation Agency

The Technology and Innovation Agency (TIA) is a national government funding and coordinating agency responsible for supporting the diversification of the economy towards knowledge-based industries, through funding the development and commercialisation of research outputs from public and private research institutions (Van Zyl 2011). In 2012, it launched an indigenous cattle assisted reproductive technologies project, in partnership with the Agricultural Research Council (ARC). The objective was to address the shortage of genetically suitable bulls through artificial insemination and embryo transfer techniques. The goal was to raise the productivity of co-operatives and emerging farmers to improve the viability of the national beef industry. The project relied on training farmers to determine when their cows were ovulating and ready to receive embryos inseminated artificially and stored for transport to small farms. Unfortunately, this project became embroiled in a complex of accusations of misgovernance and financial impropriety levelled at TIA and its Board, which led to a formal organisational review in 2013. The impact on the indigenous cattle project and its goals of growing global niche markets in the longer term is not public knowledge.

Organisational arrangements and interface structures

Interface structures at the rural university

The rural university provides support for initiation and day-to-day running of the project through the project manager, in collaboration with an animal technician or field officer employed by the trust. Besides management, the university provides research capacity, which is fed back to the communities through the interns and the project manager, assisted by the field officer. The interns and students work alongside each other with the field officer who provides practical training on best practices for looking after the cattle. This specific external interface structure is embedded in an evolving set of policy frameworks, structures and mechanisms intended to promote community engagement at all levels of the university.

Community engagement increasingly institutionalised

Prior to 2009, when the project was initiated, the approach to community engagement was without formal structure and reliant on the decisions of key leadership figures and individual academic champions. A new and more formal strategic plan was then developed to guide community engagement. This plan established a senate committee on community engagement, including deans, representatives from each faculty, student representatives and external stakeholder representatives (including local government, provincial government, firms, non-profit organisations and traditional leaders).

Faculties are now required to report their community engagement activities through this structure. A director was appointed to establish a centralised functional structure to promote community engagement, reporting directly to the Deputy Vice Chancellor: Academic. The Director initiated research on community engagement in the university's distinct rural-urban setting, included postgraduate students and aimed to influence institutional policy. The unstructured management approach continues to prevail alongside the new structures, with the vice chancellor and executive deans playing a key role in facilitating engagement through their own networks. The indigenous cattle project is a flagship programme of the department and faculty, in this changing context.

Students as the main channel of interaction

Fieldwork interviews highlighted differing opinions on the extent to which community engagement structures at the university facilitated the project. The project leader expressed concern that the notion of community engagement was not adequately understood and that consensus had not been reached at the university. At the same time, he expressed the view (reflected also in community interviews) that students are the real actors in the engagement with communities, and academics play a background role at best.

The primary direct channel of interaction between the university and communities thus seems to be through students and interns. According to the project manager, academics do not often enter the field, and co-operatives interact almost exclusively with students and interns. Academics play the role of overseeing and managing the students and interns and supervising their research. The co-operative members reported that they indeed had regular contact with academics, but it may be that they consider any person from the university to be an academic.

At the time of research there were three interns and two students working on the project and using it as a research site. For example, one Masters student reported that she was working on research into the relationship between heat stress and tick infestations, overseen by her supervisor, the project manager. Interns are graduates with qualifications in pasture or meat science who are on a one-year contract term, and are funded by the NRF. The internship is primarily used for gaining practical work experience. Interns are under the supervision of the project manager and are allocated fieldwork on community sites, where they interface directly with the farmers in their roles as resident 'laboratory technicians' within the communities, to facilitate the administration of the project. The interns interviewed reported that their research activities included record keeping, branding and ear-tagging for information purposes, vaccination, and looking for suitable grazing. One of the interns reported that after her internship she hopes to move on to graduate studies, also related to the indigenous cattle.

Interface structures at the rural university

There needs to be more discussion around this community engagement concept in universities, because sometimes I suspect that even the academics are not more informed on what role they should play in terms of interacting with communities and I also believe that some of the academics see community engagement as an entity, not as a route they can utilise in penetrating communities and improving communities.

So I think this thing still needs to be workshopped internally you know because I can tell you now that students understand community engagement more than academics, students because they've got community development projects form the student representative SRC they've got those programmes running into communities you know but academics don't, they don't.⁸²

82 From interview with project manager

*Government talks about community engagement and research, teaching and learning. Teaching and learning fine no issues, research fine no issues but research in the actual communities without the communities benefiting because research will be on paper. You see what I mean? Research will be on paper. An academic will go on to graduate, put the paper on the table and just put on the archives somewhere where people can access it but communities cannot access that. So how do you bridge that gap between the academia and the communities?*⁸³

*How do you bridge that gap? But if government does not provide money for community engagement, there's no budget for that thing, then universities cannot implement it, particularly the poor universities can never be able to implement that without a budget from government.*⁸⁴

Community interface structures

Interface modalities with the university differ from community to community, with a fair degree of flexibility in terms of the manner in which communities organise themselves. At the local level, each co-operative has a working committee headed by a chairperson. This chairperson is the key person to coordinate information and interact with other actors. Each committee also appoints one person to tend the cattle on a daily basis, a task that is allocated a monthly stipend.

Traditional leaders also play a role as intermediaries, acting as gatekeepers for access to rural communities. The consent of the local chief is required before the engagement with a co-operative can be operationalised. However, this gatekeeping mechanism rarely presents an obstacle:

*Of course we try to include the community as much as possible. For example, I know there's some areas you have to go to the chief. We have to go and get the consent.*⁸⁵

*We've never had issues with that you know for the reason that we want people to apply for the project because already when you get in there there's concern that they want to participate in this project you know so we hardly have such issues.*⁸⁶

Aside from these basic structures, the interface between the community and other actors is informal, tacit and largely interpersonal. The farmers reported that their link to the university was primarily through the field officer and project manager, and that this relationship was 'very good'. They also occasionally interacted with the project leader, but less frequently.

*The two people always come and visit us, they also go to the camp to inspect the cattle and offer us advice and make suggestions for improvements, so they do go to the camp and they know the cattle well.*⁸⁷

A typical purpose is for students to visit the site to gain experiential training with respect to pasture science and livestock tending. Students work directly with the farmers to gain this practical experience and knowledge, and they in turn exchange their academic and technical knowledge about how to take care of the cattle.

83 From interview with project manager

84 From interview with project manager

85 From interview with project leader

86 From interview with project manager

87 From co-participant interview

Government interface structures: the role of agricultural extension officers as intermediaries

Agricultural extension officers play a key role as intermediaries between community co-operative structures and the university. Awareness about the project is usually raised by the extension officers as part of their regular interaction with communities. If this awareness is taken up by the community and a collective is formed, the extension officers become the first point of contact. The extension officers are mandated to monitor projects, provide advisory services, veterinary services and assistance with infrastructure such as fencing and dipping tanks.

However, one constraint reported is a shortage of extension officers and veterinary specialists to assist the farmers, a potential gap and blockage for the project:

They don't have enough extension officers in the province. Veterinary services try their best but they are struggling because they don't even have enough animal health technicians which would then supplement what the veterinary services is supposed to do.⁸⁸

Drivers of interaction

The drivers of interaction for community-based farmers appear to be largely passive in response to opportunities offered to join the project and potentially increase livelihoods. This passive stance is driven largely by the prospect of short-term benefits. Immediate benefits include the acquisition of a herd of cattle without payment, infrastructure development with the assistance of extension officers, and access to other extension officer services. Medium-term benefits include access to knowledge from the extension officers and university academics, students and interns, as well as the upgrading of cattle herds to a more resilient and adaptable cattle breed that can withstand harsh environmental conditions and lower feed inputs while yielding higher productivity rates. The community-based farmers do need to take a more proactive stance to participate in the project as a potential means to improve farming methods, by taking a collective decision to form a co-operative and a committee. Evidence analysed later in this chapter suggests the prevalence of short-term interests driving participation in the 'gifting' scheme.

The drivers of interaction for the university are a mixture of social and intellectual imperatives. Firstly, the project is well aligned with the institutional mandate to pursue community engagement – it supports a confluence of teaching, research and engagement that is in line with the university's conception of engagement, as well as its developmental outlook. Secondly, the intellectual benefits are substantial, as the project provides a fruitful platform for academic research, postgraduate research, undergraduate training, and intern training. Thirdly, the project also brings in funding and fieldwork opportunities.

The location of the university plays an important role in framing these drivers. The university faces multiple levels of poverty, and this motivates strongly for engagement that is directed at rural poverty alleviation and livelihood development. Moreover, the university has a self-described symbiotic relationship with the small town and the surrounding villages. It is thus in the university's and community's mutual interests to pursue such developmental projects. Given that the primary source of livelihoods and employment in the region is subsistence agriculture and pastoralism, the motivation is particularly strong.

88 From interview with project manager

Innovation

The nature of innovation in this case, too, exists on the boundary of the typical definition. The changes are in poor communities that exist far away from the innovation frontier – conceivably at the other end of a notional spectrum with the innovation frontier at one end and the technological have-nots at the other. For the purposes of this analysis, the genetic make-up of cattle herds can be defined as an embodied technology. Thus, the introduction of this embodied technology in the form of stud herds and the new farming processes required to care for the cattle represents a form of technological upgrading or innovation, extremely localised in that it is new to each particular community.

The indigenous cattle breed is a principal form of Sanga cattle, a hybrid of humpless indigenous African breeds and the humped Zebu cattle, commonly known as the Brahmans, imported from Asia. This hybrid originated in Ethiopia and has since spread southwards.

BOX 6.1 *Indigenous cattle*

Indigenous cattle have played a central cultural and economic role since the settlement of Southern Africa between 600 and 1400 AD. Economic and social value were intertwined, such that the size of a herd represented a family's wealth and status, and was the basis for marriage dowry exchange between families.

'During the mid-1850s, the indigenous cattle of the Eastern Cape were decimated by two cataclysmic events. First, in the early 1850s, a bovine lung disease – introduced by imported northern European bulls in the Cape Colony – spread like wildfire across the frontier regions. Second, a young Xhosa prophetess, Nongqawuse, captured the imagination of the paramount chief of the Xhosa by demanding the sacrificial slaughter of all cattle to initiate a resurrection of all ancestors and their cattle to drive the British and settlers into the sea. With many cattle already dying from lung sickness, they seemed cursed anyway, and so began the great cattle-killing of the 1850s, which came close to wiping out the herds of the Cape, and specifically of the regions that would later become the homelands of the Ciskei and Transkei.

The adaptive skills, honed by natural selection, have however allowed them not only to survive the 1850s but many more decades of challenges, to be transformed today into a recognised breed ... Deeply respected for its ability to withstand natural threats such as periodic droughts and marginal grazing, and with a resistance specifically to tick-borne diseases, the cattle thrive on minimum management inputs' (Burgess 2007: 1).

The superior characteristics of the breed as highlighted by Burgess in Box 6.1 provide direct and important livelihood benefits for cattle farmers. The non-descript cattle breeds in the villages require frequent dipping to prevent parasite infestations and require expensive nutritional supplements in their fodder. The costs and logistics of these requirements are problematic for under-resourced village farmers.

The breed is often not the first choice of commercial farmers, as it is not the most productive breed in terms of its growth, size, milk production and meat qualities. However, the breed has the correct characteristics for subsistence or low-income farmers. The breed is highly fertile, and is adaptable to harsh and varied living conditions, poor grazing conditions, adverse heat conditions, and low feed inputs (it can survive without feeding supplements). The breed has evolved a greater resistance to tick infestations and animal diseases. Even if co-operatives do not have specific skills for animal farming, the animals can survive relatively untended, living off the local vegetation.

The benefits of the indigenous cattle breed

We have seen that the breed has the ability to withstand heat, tick infestation and diseases and all this is what influenced our interest to participate in the project.⁸⁹

They are productive and the extension officers also told us that their hide has a good sale price, and I can also attest to the fact that they can truly withstand heat and that they can also withstand tick infestation, because, we do not take them to the dip as often we take our own cattle in the village.⁹⁰

The breed is adaptable, it doesn't require much in terms of feeding, it's adapted to the environment, it doesn't have a lot of ticks ...⁹¹

If you are farming with indigenous cattle breed you need less inputs. You really need to buy less medicine, less dipping you know it also can survive on the most difficult circumstances.⁹²

Since we received the indigenous cattle we saw that our local cattle were becoming lean and starving, but the indigenous breed remained the same ... The indigenous came here before the summer drought and experienced the summer heat the same way as our local ones which got into trouble with the drought and heat. Our cattle are lean now, but the indigenous breed is still fat.⁹³

The primary innovation is that of replacing genetically non-descript cattle herds with genetically certified stud indigenous cattle herds, which requires new farming practices such as fencing and monitoring of breeding lines. 'Stud' cattle refers to the certification of lineage, going back several generations, for each animal. This allows farmers to manage the genetic make-up of their herds, and to ensure that the genetic integrity of the herd is maintained. It increases the sale value of certified stud animals, as purchasers have assurance of their characteristics and quality. In addition to breeding certified cattle, the indigenous bulls are bred with the existing non-descript cattle in order to diversify and therefore improve the genetics of the local herd. In rural areas there has been a high level of in-breeding, which results in poorly performing offspring. The addition of new genetic variance, even into the genetically non-descript local cattle, therefore also has a beneficial effect on cattle quality and hence livelihoods. To achieve this dual aim, the ratio of bulls to heifers has been kept low. The normal mating ratio is 1 bull to between 25 and 40 heifers. The ratio of gifted cattle is however 1 bull to 10 heifers. This allows for further breeding between the bulls and local non-descript cattle.

Cattle breeds are an embodied technology, and the adoption of new genetic variants is an innovation in that new farming processes are required. This central change could be classified as 'process innovation' in an agricultural setting. There are also attendant social innovations – the re-inculcation of the traditional practice of 'cattle lending', in which herds of new cattle breeds are lent to communities and then passed on five years later. This social innovation includes the establishment of co-operatives and of interface structures between these co-operatives and the university and government partners, training and capacity development among community participants in support of these changes, and the exchange of tacit and codified knowledge between communities, the university and government actors.

89 From interview with community participants

90 From interview with community participants

91 From interview with project leader

92 From interview with project manager

93 From interview with community participants

There are small pockets of commercial indigenous cattle breeders spread across South Africa, both in the Eastern Cape and in other provinces. The innovation could be described as a 'transfer' of existing technologies – cattle breeds from elsewhere are brought into communities through organisational structures that are also new to the community. Despite the limited 'newness' of the innovation, it has made a large impact on the livelihoods of communities, largely related to the adaptable characteristics of the breed.

At a national level, the project was identified as potential opportunity for emerging small farmers to produce organic beef for niche export markets. To support the growth of such an industry, and access to formal markets, the TIA supported innovation in the form of processes of artificial insemination and embryo transfer that would allow for a more rapid and wider dissemination of the genetic stock. In 2012, TIA launched a R24 million funded assisted reproductive technologies project, to overcome the challenge that most small-scale farmers do not have bulls with high-quality genetic material, leading to low breeding rates and high mortality rates and, hence, an unproductive sub-sector not contributing to local or export markets. There is, however, no available evidence of the reach or achievements of this project.

Knowledge and skills

The central knowledge flow is characterised by codified knowledge from the university and government actors to the community participants, and tacit knowledge from the communities to the universities, particularly to students and interns. The primary area of knowledge generation is academic research that has the farming communities as research site. The primary skills-development and capacity-development areas are among students and interns on the one hand, and, with more limited learning community participants on the other.

The project leader and community participants reported a broad suite of training activities. The community-selected 'livestock manager' receives basic training and equipment from the provincial department, including organisational training, basic animal branding techniques, castration and basic animal health. This training is undertaken by a coordinated team of interns, students and extension officers. Students reported that they are also involved in training activities related to applied codified knowledge, for example:

We were assigned to try to come up with maybe ways of trying to increase production in these farming communities ... because I have majored in Pasture Science so I have got more knowledge in how to manage grazing of cows in specific lands and in trying to control so that cows don't overgraze so that the veld is kept productive throughout the whole year so that all the cows benefit from it so that production can increase; so I'm trying to train them on that and she was basically on the side of record keeping, trying to teach them how to take the records and how to manage the records.⁹⁴

Interns and students claim to gain field experience that informs their studies. The project model assumes that while the students acquire hands-on experience from the cattle farmers, they also exchange their theoretical knowledge with them so as to create a mutual relationship for co-construction of practical knowledge in areas of pasture science and tending of cattle. The interns however reported that the uptake of training and mutual learning has not always gone smoothly, suggesting the limits of what is in effect a traditional, uni-directional knowledge diffusion through extension model:

94 From interview with students and interns

They do not have much knowledge about diseases and seasons and stuff like that. They basically just introduce the cattle in there and they just leave them there in the veld to graze the whole year without the knowledge of identifying a cow that is limping or maybe they have got ticks or the cows are not producing any calves ... they do not have that kind of knowledge so that when you go there maybe after a year you find that maybe their heifers did not really reproduce over there, not because that they won't, but because they were not treated in time maybe for that specific opportunistic disease that they had. So the knowledge is lacking in a way so we trying to implement knowledge and we are trying to train them to gain skills about farming, about business farming actually. We have actually helped them a lot in a way.⁹⁵

The interns reported substantial learning for themselves, particularly in the form of practical experience and tacit knowledge, as well as the softer skills of relationships and group dynamics:

I've learnt a lot of stuff from them in their way of actually managing the farms and the types of climate variations and environments that they are in and how they survive in having to control their herd maybe against theft and also controlling them not from going to the streets and not going to be hit by cars and stuff like that. Ya, they interact with us in those kind of manners and they tell us their difficulties and their views.⁹⁶

I've learnt how to do branding, I've learnt how to do ear-tagging and how to control and relate to communal farmers in a way.⁹⁷

One of the main areas of tacit knowledge gained by the university relates to the role of social dynamics in influencing the processes and outcomes of rural development projects:

So most of the things that we've learnt from the community for example was just basic community dynamics. There could be, you know it's so easy to say people are in a group, they in a group but then there's one person who just say, I want to bring my own bull, because they say get rid of your bull as a community so we can introduce our own, but you go there if someone does not want, or they can pretend they have removed the bull and after two months you find or when the first calf is coming you find out this is a cross it's not pure on this, the young animal. So we've learnt a lot in terms of community dynamics, but we've all, the students in particular have also learnt quite a lot about some of the management practices that are there, what they learn in class, we teach them proper, you know you do this, you do but when you go to the ground it's something else.⁹⁸

Academics have access to on-site research experience that contributes to knowledge creation, but their direct exchange with communities is largely uni-directional. Generation of codified knowledge for the university is considerable, reflected in the academic research outputs related to the project, described in detail in the 'Outcomes and benefits' section of this chapter. Apart from the students' dissertation work, the students also contribute to research outputs together with their supervisors. Involvement in the project contributed to building up meat science as a research niche at the university:

One of the bigger things that have come out of this activity is our meat science research activities. We've got a very strong meat science research group ... So we've learnt quite a lot and developed our research niche around this concept, and at the moment we hold one of the research chairs in meat science in South Africa – it's mostly because of the work that we've done.⁹⁹

95 From interview with students and interns

96 From interview with students and interns

97 From interview with students and interns

98 From interview with project leader

99 From interview with project leader

African indigenous knowledge plays a small role in the social and organisational innovation, which helps to gain traction in traditional communities, where the concept of cattle lending resonates, as it is not alien or externally imposed. However, the role of indigenous knowledge systems in cattle farming was framed by the project manager as largely irrelevant to the improvement of cattle performance:

You know they got their own medicine to treat animals, they go and get herbs and stuff and mix it and you know give it to animals and we don't have a problem with that you know because it's just herbs; in fact the animals actually eat herbs themselves in the fields so we don't have issues with that.¹⁰⁰

In contrast, the community participants valued their own traditional knowledge:

We grew up herding cattle. We can see when a cow is sick and we can almost tell what the sickness is all about and what of kind of medication we should give it. We have traditional medications that we give to our cattle in certain seasons. In other words we have knowledge of vaccination methods to prevent sicknesses and diseases. We also have our own castration methods, which we are still comparing to the new methods.¹⁰¹

According to community members, staff and students from the university have never questioned them directly about such traditional knowledge. It thus seems that the knowledge flow from the community is limited to practically gained tacit knowledge rather than potentially valuable indigenous knowledge or co-construction of knowledge. The flows of knowledge are those of a traditional service learning or agricultural extension model, with little active learning on the part of the community and, it seems, limited social and environmental value added to their livelihoods.

Community participation

The nature and extent of community participation is difficult to ascertain without conducting field research with a broader sample of the 72 communities involved. Some basic characteristics can be established from the focus group interview with community participants and from interviews with academic staff and project management.

The degree of community participation is not high. Communities do not play a central role in terms of knowledge processes as the training, organisational platform and basic structure of the interaction is determined by the project design, created by the university and government actors, with no community participation in the identification of the problem or the solution. There is a community representative on the Board of Governors, but this does not equate to broad participation at a community level.

The process does take steps towards being participative, in that it is premised on community organisation rather than individual recipients, but these processes are largely uni-directional, taking the form of consultation and participatory dissemination. After their agreement to participate, the extension officers held a 'handover function' that disseminated information about the project to local community members. This community experienced a long delay in receiving cattle after their initial application, with no explanation, which did not promote proactive agency:

¹⁰⁰ From interview with project manager

¹⁰¹ From interview with community participants

When the agricultural extension officers came to us, having seen our seriousness and that we were a group with clear goals in mind, they were satisfied. They asked us about what we think can develop in our community and in that regard we requested these cattle. But then, although the request was made in 2007, these cattle only came now in 2012 as the last speaker already indicated.¹⁰²

Other challenges related to community participation stem from issues within the community and the co-operative. During the focus group interview, the chairperson of the co-operative, together with a few of the informal farmers, indicated that there was a high level of complacency among some of the co-operative members in terms of their practical involvement with the cattle, continued inspections and general tending. It was suggested that during cold weather some members would not go out to the camp where the cattle are situated, and as a result the cattle miss their daily inspection and are at greater risk. In this community as well as others like it, a large proportion of the population work during the day, leaving cattle tending to the elderly men, who do not have the strength to travel to the camps or take action if they observe anything unusual.

Interviews highlighted conflicting reports about the extent of active community participation and knowledge flows. Community members complained that research undertaken on site had never been reported back to them or lead to any follow-up visits. On the other hand, the project leader offered a different view, that such follow-up does normally take place, although through the channel of students and the project manager:

So we've got a chance to regularly visit the farm and give feedback on what we are working on, but it may not be the case with the other people who are coming from other departments, mostly due to logistic or other challenges, but what we normally do is, we give them feedback, in terms of the meetings, we got a manager like I said who's always going visiting this project. So whatever we've got we've tried to attach students under that manager, then take the feedback to the communities.¹⁰³

The lack of agency in the design of the project may lead to this lack of ownership. Some community members perceived that there may be little individual incentive to invest time and energy in their maintenance:

If you have 10 cattle and you have a community and people would be in to say 'I'm not gonna gain personally, I'm not gonna gain anything from this project you know, it is meant to fix the roof of the crèche, buy books for that library in the village and so on, not for me.'¹⁰⁴

A similar dynamic is manifest in one of the main challenges for the project at the community level, introducing new fencing practices to ensure the purity of the breed. Villages in deeply rural areas are not demarcated with fencing borders. Communally owned land is often not fenced, as it provides communal open pasture for a community's cattle. Cattle can move freely across borders and are vulnerable to theft and cross-breeding. When it comes to managing new breeds and studs, this is a problem:

From what I've seen mostly from the communal farmers is the issue of fencing, because the communal government got other priorities, so sometimes when you want fencing it's not available, and the consequence of this project, it's also based on the improvement of the management of the pastures, the grazing lands. So when you don't have fencing if you want to practise rotational grazing you can't, so it's one of the challenges that most of the farmers always raise whenever you talk.¹⁰⁵

102 From interview with community participants

103 From interview with project leader

104 From interview with project manager

105 From interview with project leader

The task of building fences is labour intensive and requires financial input for raw materials. These are both problematic. According to community participants, if the project provided them with the raw materials for fence construction they would be able to make more progress:

Many people are lazy to go out for fencing, but we are willing to do so if we can get enough fencing wire and poles. In that way we will know that our cattle are safe and controlled within certain boundaries so that we do not have to go a long way to inspect them ... We were promised by the extension officers that they can organise fencing materials so that we can do the fencing [but this has not been received].¹⁰⁶

Further evidence is required to provide a more systematic analysis of the reach and depth of agency and active community participation in the knowledge dimensions of the national project, but it is clear that in this case, the community were largely recipients rather than active participants.

Outcomes and benefits

The intellectual benefits to the university are substantial. For the academics, the project has provided a site for research that has led to research reports and more than 60 peer-reviewed publications. In recent years, peer-reviewed papers reported included one in 2012, six in 2011, two in 2010, seven in 2009, six in 2008 and three in 2007.

The project has been a popular research site for postgraduate students. Five PhD and six MSc graduates have focused their research on the project and an unspecified number of honours and undergraduate students have done so. A further PhD, four MSc and two honours students were busy with research related to the project. These students have gained important tacit knowledge from their time spent in the field, and have also learned applied research skills in the process. Over the past two years, more than 35 interns have participated in the project, funded by the NRF and the Department of Science and Technology. The academic impact is also evident in the award of a South African Research Chairs Initiative (SARChI) chair in Meat Science, shared with Stellenbosch University, the award of a Technology and Human Resources for Innovation Programme (THRIP) grant in collaboration with Red Meat Research and Development of South Africa, and the registration of a patent on meat science (Muchenje 2013).

The benefits to community participants have reportedly been substantial. The scale of the project is large, extending to over 70 communities in the Eastern Cape. At the community level, there are reported benefits in terms of skills development, infrastructure and improved cattle herds, which together lead to an overall impact of improved livelihoods and socio-economic development.

On a national level, the project has a wide-scale reach, in that it has been rolled out and funded by the IDC in six other provinces. The TIA artificial insemination and embryo transfer project is an indication of the potential impact and reach of the original project initiated at the rural university. The project has reportedly fared well at the University of Limpopo. Here, it was difficult for farmers to sell their cattle to feedlot companies, as the cattle do not do well under feedlot conditions. The university initiated research to find a solution, in collaboration with the ARC, Northern Cape and Limpopo departments of agriculture and the national Department of Land Reform and Rural Development. The solution proposed and trialled was 'terminal cross-breeding' whereby Angus bulls were cross-bred with a proportion of the herd that were sent for slaughter, while a third of the herd were kept genetically pure for further breeding purposes. The researchers suggest that the results indicate support for terminal cross-breeding as a strategy to increase the output of beef cattle. A large retailing company agreed

106 From interview with community participants

to sell meat produced by the terminal cross-breeds as certified Angus beef and, in this way, access to large formal markets was secured for those co-operative farmers (Ng’ambi 2013).

The project did not fare well in KwaZulu-Natal, where it appears to be run from the provincial Department of Agriculture, involving tribal leaders and an agricultural college rather than a university. The KwaZulu-Natal project was shelved for a time due to allegations of financial impropriety, but was revived in 2012 (Mavuso 2012).

However, there is little hard evidence systematically documenting the outcomes and impact of the national project. A lack of monitoring and evaluation and periodic reviews of progress limits the possibilities for learning and capability building more widely. This is particularly a problem as the project has fired the imagination of the DST and its agencies as a ‘best practice’ case of innovation for inclusive development. The indigenous project is cited as a model for what is possible through science and technology in terms of the aspiration to access competitive global niche markets, and at the same time, create livelihood opportunities and promote economic development amongst the most marginalised, the rural poor, non-commercial farmers and black-owned co-operatives.

TABLE 6.1 *Outcomes and benefits of the interaction between the rural university and the cattle co-operatives project*

	<i>Community participants</i>	<i>Rural university actors</i>
Outputs	New indigenous purebred cattle	Academics: research reports, research papers, one patent
	Improved genetic stock of existing cattle	Students: theses
Outcomes	Improved performance of cattle herds: increased resistance to ticks, heat, disease and low feeding inputs	Academics: building meat science as a niche field for the School of Agriculture; building knowledge related to the project, building cohorts of postgraduate students
	Improved livelihoods as a result of improved performance of cattle herds	Interns: practical experience, tacit knowledge
	Building absorptive capacity within communities	Students: practical experience, tacit knowledge
		Building research capacity in the university in relation to informal livelihoods and impoverished socio-economic contexts

A contrast case: misalignment with markets in a rural innovation hub

A second potential case was explored at the rural university, based in the same Faculty of Agriculture on the rural campus – a more formal external interface structure to link with surrounding rural communities. An agricultural park was established in the same period, in 2003, as a model for an ‘R&D laboratory hub’, and intended for replication on a larger scale across the small rural towns and communities in the province.

The project was also the brainchild of a former dean of agriculture. The relationships to sustain it are highly formalised, and based at the university, rather than within communities themselves. Community members are required to come to the university property, rather than remain in their own locales to pursue their livelihoods. The initiative is underpinned by a formal memorandum of agreement between

the university and provincial government departments, as it is seen to support provincial and national development plans to alleviate poverty, create jobs and promote food security. The provincial strategy promotes small-scale agriculture as a solution to poverty and unemployment given the availability of extensive underutilised arable land. The university recognised the challenges that small-scale farmers face in accessing markets, growing quality produce that meets regulatory standards, meeting market demand with a steady and timely product, transporting products to market and 'other factors that serve to drive costs up, competitive sales prices down, and profits under' (Rural University (2013).

Starting from the premise that the most important challenge is to empower small-scale farmers to participate in formal markets, the university designed the agricultural park model, using the model for an innovation hub or incubator for small businesses in urban-based universities. Public procurement policies at provincial and local level that promote the participation of SMMEs and marginalised producers provide excellent opportunities to secure large markets for such a hub. There is national government interest in rolling out such a model to universities in other provinces, and the provincial department of agriculture has used the model at another site in the province.

The agricultural park houses a set of co-operatives that employ retrenched workers and provide an opportunity for student learning and staff research. The current project is based on three functional inter-connected units: a nursery for seedlings to supply plants to community farmers, a farming enterprise ('fields') in close proximity, and an agro-processing unit that serves local farmers and the co-operatives farming the fields. The focus is on growing vegetables, and the agro-processing facility's main product currently is dried processed vegetables.

The university owns the land, and covers the cost of infrastructure, electricity, water, maintenance and management on behalf of independent co-operatives, who will pay their own way once they are established and running at a profit. Funding was sourced from provincial and national government departments. For many, the agricultural park is viewed as a government initiative, although housed at the university. The university wrote proposals and raised funds for infrastructure such as an irrigation system for the farming enterprise, and the construction of a vegetable drying unit by external providers. An initiative was in the pipeline to convert waste from a piggery to methane gas to be used to drive generators, funded by the DST, and the drying unit attempted to use solar geysers as the source of energy. These reflect attempts at introducing green energy sources to support rural economic development. Indeed, securing sufficient funding does not seem to be a challenge at all.

Like the indigenous cattle co-operatives project, the agricultural park operates under the guidance of a Board to ensure good governance. In practice, the dean and the university take responsibility for the daily running of the projects. It was reported that academics were involved with the product development for the vegetable drying, but are not involved on any ongoing basis. The university pays for a community liaison manager to support the co-operatives on a day-to-day basis.

Currently, there are 5 co-operatives and 45 individuals employed. Those involved in the co-operatives tend to be older, and young people are not willing to remain in the project.

However, a tour of the processing facility revealed that large-scale and expensive equipment such as industrial dryers, are currently standing idle. The co-operatives are producing at only a small fraction of the potential output of the facility. They sell to local markets on a very small scale, and are not even able ensure the livelihoods of their members.

Co-operative members do have a long-term view, but have seen little return and benefit from their work. For the processing unit co-operative, for example, the university raised funds to provide an allowance until the market grows:

They need a little bit of an allowance to keep going, otherwise its coming and going for nothing ... they have been very patient, because they have the hope that one day, if you sell this stuff, you will get money.¹⁰⁷

It seems that there are gaps and misalignments in the interactions between academics, students, communities and local government so that the full potential of the opportunities is not realised, and the livelihood challenges of small-scale farmers are not addressed.

The major external blockage lay in accessing the intended market. The plan was that the agro-processing unit would produce for public sector markets in the province, given the extent of funding available for social development, specifically, for government school-feeding schemes. (We have seen in Chapter Four how the leader of the soya co-operative was able to access these markets.) A formal agreement was in place so that a virtuous development cycle could be established through government procurement from community co-operatives. However, the Department of Education changed their procurement from a centralised system to an individual school basis. To access individual markets requires a higher order marketing strategy and administrative capacity than the co-operatives were capable of. To access alternative formal private sector markets requires compliance with food safety standards and regulations which, again, the unit and its members were not yet geared for.

The processing unit thus has equipment and infrastructure, but neither the university academics, project managers nor co-operative members have the capabilities and skills to access public or private markets on a large enough scale to fully utilise their resources. This has ramifications beyond the immediate co-operatives:

The bigger plan, the business plan that we submitted, involves external producers who then supply the processing unit. You would have then secured a market even for those little projects that government have funded. Remember there are many projects that are funded by government departments: Social Development, the Department of Agriculture, Rural Development, everybody they fund projects and these people don't have markets. Now this provided hope for these people. As a result they still phone our office to find out: 'When are you coming to buy, when can we supply? How much do you need?' And so on. So it provided hope, you know. If only we can secure a public sector market then I'm telling you everything would just fly.¹⁰⁸

A significant internal constraint relates to the limited participation of marginalised individuals in the co-operatives, and to the fact that knowledge flows are uni-directional. The sense gained from the interviews was a lack of proactive involvement on the part of co-operative members, and that they are waiting for others to solve basic problems to do with market access and overall entrepreneurial strategy. One key channel of interaction was the training provided to co-operative members by the community liaison manager and by bringing in expert consultants. The interaction was characterised by knowledge and skills flowing from the university actors to the community actors, through the formal relationships set up within the agricultural park. Training agendas were set in advance by the university actors, focused on the perceived need for skills in organisation and running of co-operatives and to the specific activities required to run each of the three business units. It was not sufficient to interact around agricultural and farming skills or even to transfer skills around agricultural processing and value-addition.

¹⁰⁷ Interview with community liaison officer

¹⁰⁸ Interview with project manager

The uni-directional interaction apparently characterised the students' role as well. The seedling nursery is a site for student and academic research. However, this seems to be a one-way relationship, as a site for student learning with little knowledge exchange or benefit to the community co-operative that works in the nursery. As one project manager complained:

Students go there, take some soil samples and never go back and say 'look, these are our findings, so you need to use a different type of fertiliser instead of this one.' So it's just students doing research and leaving.¹⁰⁹

Community actors reported very little engagement with or feedback from students, and little involvement of academics from the university, aside from two individuals who are committed to driving the project. There was also evidence of conflict within the co-operatives that, university actors argued, requires extensive management and support to resolve.

Community participants have been supported in a way that erodes their own sense of agency. So, for instance, a major concern highlighted by the co-operative members was the lack of security of tenure, given that the land was owned by the university. Co-operative members reported that they had attempted to access their own markets, but were not able to access loans to buy the necessary transport – because of a lack of evidence of their secure tenure to the means of production. The university actors in contrast, reported that lease agreements were concluded that should have served the purpose.

Unlike the indigenous cattle co-operatives project, the agricultural park does not have a strong dimension of social innovation and is not rooted in the cultural and social practices of the farming communities. The project is premised on a 'grand plan' that operates top-down to bring communities into a dedicated space within the university, to operate as a business – but without due consideration for the skills and capabilities required of the co-operatives to access markets, nor understanding what it takes to run a viable and sustainable business. The formal plan designed and agreed between the university and the provincial government evidently did not factor in the volatility of markets, or the agency of the community actors.

Conclusion

The indigenous cattle co-operatives project is an example of the power of structured community engagement to benefit both academics and communities. The project potentially reverses the historical loss of the traditional indigenous cattle breed, and has significant livelihood benefits for pastoral communities. The national funding and spread of the project on a wider scale to include other universities as the hub in six provinces is testament to the potential inherent in the design, and the way it has caught the imagination as a model of university engagement in innovation for inclusive development.

Enablers and constraints

The analysis of the rural university case points to a set of critical enablers, based on the political and social traction inherent in the notion of restoring traditional cattle breeds, aligned with provincial government strategies and the university's development-oriented stance, whereby success of the university and of the host communities are intertwined:

- The structure of the interaction, which overlays a national co-ordinating framework and a local interface structure based at the university, serving a specific province
- Funding from a national industrial development funding agency committed to growing the competitiveness and productivity of the rural economy

¹⁰⁹ Interview with manager

- Funding from and collaboration with a provincial government Department of Agriculture
- A university strategic mission and community engagement policy that is broadly supportive of and directly promotes interaction around livelihoods with rural communities, given the interdependence of the university and the surrounding community
- An academic champion who developed the concept and designed a project that resonates with traditional social practices
- A local interface structure channelled through the university, which provides operational support and administration
- (Potential for) bi-directional knowledge flows that are characterised by codified knowledge from the university to the community, and tacit knowledge from the community to the university
- Agricultural students and interns as the main channel of interaction linking the university to individual community actors
- The key role played by provincial agricultural extension officers as intermediaries linking communities to the project, and supporting the university team in their ongoing interaction with the co-operatives
- Participation driven by and requiring a degree of strategic initiative from the co-operatives in response to the perceived benefits of participation, and a medium- to long-term commitment
- Community co-operatives that provide an interface between individual members and university actors
- Active and regular communication between the co-operatives and key university and government intermediary actors with dedicated roles in the project (project managers and extension officers), to support everyday operations and specific activities
- A virtuous cycle over time means that ongoing evidence of the substantial livelihood benefits to communities, and intellectual benefits for the university, continue to motivate funding and participation.

The challenges and blockages relate to sustaining and deepening community participation in order to ensure the potential of the innovation to realise full benefit for small farmers' livelihoods, on a wider scale:

- At the local level specifically, a lack of community commitment to secure fencing was a challenge to maintaining the genetic bloodlines of indigenous cattle and, hence, the success of the project
- Within the university, the notion of community engagement was insufficiently understood, and there remains a lack of articulation between research, innovation and engagement, as well as a lack of financial commitment to the cause of community engagement
- The prevalence of the traditional agricultural extension model and the community service notion of interaction appear to limit the community co-operatives' participation as active agents, with limited scope for input into the project design or even administrative processes, creating a sense of the community as recipients
- The process of knowledge flows are not bi-directional in practice, with evidence of a critical feedback loop missing between academic researchers, students and community, serving to limit active ownership of and care for the herd, and active community participation in the project overall
- Competing framings of indigenous knowledge systems are a potential blockage, in that community participants perceive them as central to their livelihood activities, while the project manager identified them to be largely irrelevant.

Innovative solutions for sustainable urban settlements at a comprehensive university

Action research into sustainable urban settlements: a participative response to a national priority and the needs of a local community

The community partners live in an informal urban settlement and engage in tenuous livelihood activities in formal and informal jobs based in the nearby affluent communities. The community currently faces further marginalisation in the form of resettlement at a distance from their livelihood opportunities, due to the environmental vulnerability of the area in which the community had illegally settled. This, too, is a uniquely South African story, related to patterns of spatial segregation as cities developed, with the result that the issue of sustainable human settlements has become a major social and economic development problem. The South African government has acknowledged and prioritised the need to create sustainable human settlements. The problem, however, is that there are few examples where such projects have been attempted – let alone successfully completed (Cherry & Lemercier 2013). For the purposes of the present study, this is where the potential for innovation lies.

The focus case is a very new interaction between the comprehensive university and the community based in an informal settlement, pursued under the rubric of pilot project, initiated in December 2011, only a year before fieldwork. The specific catalyst was the threat to move the informal settlement, as it is currently located in and causing damage to an environmentally sensitive area. This served as a focal point for other actors attempting to find solutions to the broader problem of sustainable human settlements. It thus presents a case of an engagement at the pilot phase. The pilot project was designed in three phases, beginning with a baseline study, proceeding to research and testing of appropriate technology for housing and service provision with the communities, and then, on that basis, compiling a comprehensive plan for the in-situ development of two settlements (Cherry & Lemercier 2013: 7). At the time of writing, the actors had completed the first baseline phase, and were due to begin the second phase of the project, envisaged to run for 18 months.

The core balance that the actors are seeking to establish is between the livelihood needs of the community and the interconnected need for environmental sustainability. Balance is sought by avoiding the route of unsustainable traditional construction methods, and instead identifying technologies that can make the settlement truly sustainable:

The premise or the assumption of the research is that we can accommodate human development needs without destroying the environment. So that's our premise as a transition network and as sustainable development practitioners. You do not have to compromise the environment in order to meet people's need for power and water. You don't have to destroy the forest and put in bulk infrastructure.¹¹⁰

Overview of the interaction

Following a 'service delivery protest' by the residents of two informal settlements in August 2011, the residents of these two areas finally got the ear of the local municipality. In South African post-1994 public discourse, 'service delivery protests' refer to public (sometimes violent) demonstrations that take place when local governments or municipalities fail to render basic infrastructural services, such as water, sanitation, electricity or housing, that have been promised to poor and marginalised communities. In short, the residents protested because they need formal houses – which they had been promised for some time.

In September 2011 the municipality called a meeting of the residents with a researcher from the university, based on her prior engagement with government and relevant research. One of the residents describes their first meeting with the project leader:

We had a meeting in town with the municipality and she was there. And then it emerged from the meeting that someone was going to conduct research on housing issues and we were told that she was to conduct this research.¹¹¹

During the meeting, it transpired that the municipality was finally prompted to take action because they had been interdicted by the provincial Department of Agriculture, Forestry and Fisheries (DAFF) from building new houses on the current site. It emerged that indigenous trees in the area cannot be cut down without an environmental impact assessment (EIA). Furthermore, the land is privately owned. The point of the meeting was to find solutions and a way forward:

There was a series of service delivery protests and as a consequence of the protest community delegations were brought to the City Hall and to meetings at the municipality, I think I've attended about three of those meetings and basically those were the meetings where the community representatives and the municipality was trying to thrash out like what their demands are, what are their priorities and so on and the municipality was responding by saying, 'We can't move on this, we need to have this research process where people come up with solutions.'

So the municipality then at these meetings publicly with the community members said, 'Look this is a way forward, the university which is not tied to the City politics if you see what I mean there's a lot of conflict within the ANC and within the Metro and so on, but the university isn't tied to that ... If we can really engage the community as university team and get them engaged in a way to find a way forward which will be acceptable to both settlements and acceptable to DAFF and get environmental approval then they see that as a solution ...' The communities have accepted this and said, 'Okay we'll give this a chance, we will put forward a community research team from both sides and we will see what happens, if that community research team can come up with us with an acceptable solution.'¹¹²

There is a lot at stake for the residents. If they concede to the municipality's initial proposals to relocate them, they would be far removed from their jobs and thus their livelihoods would be affected:

110 From interview with project leader

111 From interview with community participants

112 From interview with project leader

So basically the informal settlements service an affluent white settlement down the road you know so people have jobs there domestics and gardeners and they work in the shop and the different service providers, some of them work in the nature reserve and anyway.

So one of the central arguments that needs to come out of this research is that people want to stay here because they have economic opportunities, they have a cohesive community and they have opportunities for livelihoods in the area which involve both employment opportunities and self-generating income opportunities. And that also involves the broader affluent community who you know I mean it's not really in their interest that this community is moved to another world which is 50 kilometres away.¹¹³

Finding a viable solution to the issue of sustainable human settlements is critically important to the livelihoods of the residents of the informal settlement:

The majority of the residents of informal settlements obtain livelihoods for themselves and their families through a combination of part-time or casual employment, income-generating activities and state grants. Those who are in formal, full-time employment are almost all employed locally – as domestic workers in private households, as cashiers, packers and cleaners at local retail businesses (hardware store etc.), as gardeners or labourers for gardening services, and as private security or in government employment (cleaning companies with municipal tenders etc.). Some residents obtain casual employment (one or two days per week) in the above jobs. (Cherry & Lemercier 2013: 38)¹¹⁴

Community participants interviewed highlighted the importance of remaining in their location:

How are we going to go to work if we stay in a place so far away? Most of us work in this area ... We don't even need to take taxi to go to work. We walk because it's very close by.¹¹⁵

Hence, the proposal emerged to conduct action research into sustainable human settlements, funded by the provincial government and carried out by the university team in collaboration with community participants.

A 'technology for poverty reduction' national policy stimulus contributed indirectly to the initiation of the project, which can be traced back to a visit to the metropole by the then Deputy Minister of Science and Technology in 2009. According to the project leader, the minister 'challenged' the university to find innovative solutions for informal settlements (Cherry 2012b: 3):

About four years ago the Deputy Minister of Science and Technology visited the city and went to one of the informal settlements and he invited me to go there and basically he made a challenge to us, well myself as a university academic and said 'would, isn't there a way that the university can help us in these kind of settlements to find appropriate solutions to provide housing and services more quickly you know instead of waiting for long-term development.'¹¹⁶

A series of consultations ensued between the university, a local NGO network and the research directorate of the provincial Department of Human Settlements (DHS).

113 From interview with project leader

114 In its baseline research report of 2013 on the first phase of the project, the research team strongly recommends that the community remain where they are as they currently have livelihoods opportunities there.

115 From interview with community participants

116 From interview with project leader

From the perspective of policy influences, the idea of 'sustainable human settlements' in the Eastern Cape began in 2008 with two documents: 'Provincial Medium Term Sustainable Human Settlements Research Strategy' (2010) and the 'Multi-Year Sustainable Settlements Strategic Research Agenda' (Cherry 2012b). The interaction between the university departments and the provincial DHS is informed by these documents, in which the DHS identified its priorities to create integrated sustainable human settlements based on an integrated planning, policy, research and legislative environment and using good governance. The DHS was familiar with the work of the comprehensive university's departments in this area. Hence they approached them and formalised their interaction with a signed Memorandum of Understanding (MOU) in November 2011. The purpose of the MOU was to:

facilitate cooperation, collaborative framework, advancement of knowledge and reciprocity, mutual benefit and frequent interactions between the Department and university in the development, review, roll-out, monitoring and evaluation of the Multi-Year Strategic Research Agenda aimed at supporting the creation of integrated and sustainable human settlements within the Eastern Cape. (Province of the Eastern Cape 2011: 4, cited in Cherry 2012a: 2)

To implement the MOU, the university project leader developed a research proposal for a pilot project, in the face of concern that although there had been low-cost housing delivery, this had not created sustainable human settlements.

The university departments established a research group with a master's programme. In 2011, five master's students involved in the programme conducted case studies on sustainability and newly constructed low-cost housing developments (Cherry 2012b: 2–3). It emerged that the current 'delivery frameworks' do not yield self-sufficient sustainable settlements. The overall research project therefore has as its aim to evaluate these issues, build capacity in the community, and ultimately implement the construction of sustainable settlements. This is all to take place in the context of an action research methodology, a highly participative and reflexive mode of engaged research:

this radical research methodology involves the researcher as actor in the development process, and the community as equal as well as researchers and documenters of their own actions. Instead of conducting an evaluation of an existing programme or process, as 'neutral outsiders', the researchers play the role of facilitators and assist the community who are not 'beneficiaries' but are also both actors and researchers. The 'action-reflection-action' method is used to generate critical reflection and documentation of the implementation process, which feeds into the next phase of implementation ... Following the baseline community assessment ... the community engages in a process of designing their own community according to the principles of permaculture ... This process of design serves as the transitional tool linking the community survey to the implementation. This first phase, which will combine education, skills training and community mobilisation, is critical for the success of the pilot project because the alternative design and technologies proposed are not well known or understood. Moreover, the strategy of implementation does not consider the residents of the new settlement as 'beneficiaries' of a 'housing project', but on the contrary as actors, change agents and designers of their own future homes and livelihoods. (Cherry 2012b: 12).

The first phase of the project included action research in which members of the community explored alternatives and came up with their own plan for development. This included exploration of cost-effective and eco-friendly technology such as bio-digester toilets, sandbag houses and solar lighting. Five community participants were trained to become 'community researchers' and play a more active role in the knowledge-generation component of the project. The team of community researchers was elected by the residents, on the basis that they were already in leadership positions in their community.

Funding for the initial research came from the provincial government, channelled through the university research team. If the research is accepted by the municipality as a viable way forward, the provincial department will also fund the implementation phase of the project. Funding is also channelled from the national DST, through the university structures.

The project aims to create a small number of new livelihood options directly:

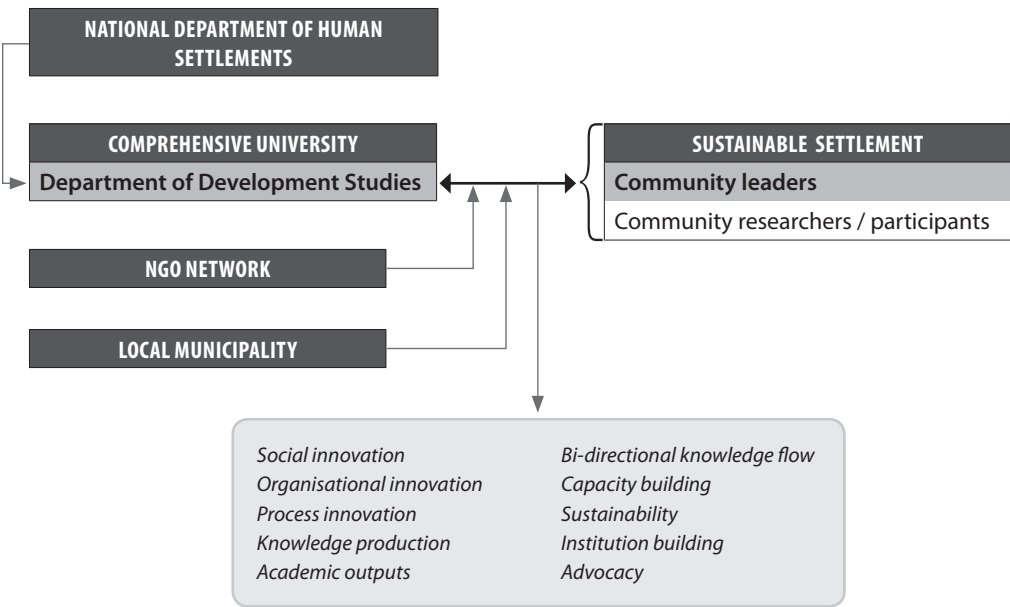
The livelihood component is also that the people here who are trained as community researchers will benefit directly from the project through for example providing catering for the workshops and so on, but in the long term we would hope that other members of the community would be trained in skills which would get them livelihoods for example maintaining solar [energy] systems.¹¹⁷

The structure of interaction

The comprehensive university research team works closely with the residents of the informal settlement, using the action research paradigm, so that the community can identify and ultimately be part of the process of finding solutions to their own problems. This foregrounds community participation in all aspects of the interaction. Actors in the network are the the comprehensive university department, the provincial Department of Human Settlements, the metropolitan municipality, the local NGO network, and the community of the informal settlement. A dormant actor, playing an unclear role in the interaction, is the absent private owner of the land.

The university department provides (mostly codified) knowledge, facilitation, research and training. The NGO is a knowledge partner in the area of sustainable technologies. If the project reaches the implementation stage, the municipality will join as an implementing partner.

FIGURE 7.1 Map of interactive partners: informal settlements project



117 From interview with project leader

The social partner: the community

The informal settlement is on the outskirts of the metropolitan district of Port Elizabeth, the largest urban centre in the province. It is a relatively small community of approximately 380 households. According to the project leader, people came to live there about 15 years ago. The community currently lives in self-built informal dwellings built from corrugated iron and wood. The community is clearly marginalised, poor, and their livelihoods are pursued in informal settings.

The higher education institution: the comprehensive university

The comprehensive university offers both professional and vocational training, alongside traditional academic offerings. Universities of this nature differ from traditional 'research' universities in that their programmes are geared towards workplace and community needs. Chapter Three traced a dual pattern of interaction, whereby community partners were primarily associated with teaching-oriented forms of interaction, while firm and academic partners were more likely to be associated with research-oriented interaction. The project thus reflects an emergent niche in the university, of research with community partners.

Postgraduate teaching was an integral component, however. The main department of Development Studies was established in part to accommodate the large number of students acquired following the merger. The department has approximately 400 graduate-level students, six contract researchers and project staff, and associated academics within and from outside. There are a number of master's students conducting cognate research at different sites, and a doctoral student from the School of Architecture involved in the project.

The NGO network

The network of NGOs is centred on the notion of transition to a 'zero-carbon future'. They have expertise in permaculture design, incorporating food gardening, renewable energy, waste and water infrastructure and housing construction (Cherry 2012b: 7). The NGO's role is as a knowledge partner with a speciality in sustainable development technologies. Currently, one of the members is busy with demonstrations of ecologically-friendly solutions for the sustainable settlement. They also plan to be involved in training related to these new technologies.

Government actors

The project is framed by a complex housing challenge in South Africa, which has played a prominent role in the national social, political and policy discourses. In the political discourse, the South African government has acknowledged that the backlog of housing cannot be viewed in isolation from its colonial and apartheid history. This means that beyond the question of housing, there are socio-economic issues to consider, such as the question of employment and livelihoods. In 1994 the new government acknowledged that: 'Housing the nation is one of the greatest challenges ... The extent of the challenges derives not only from the enormous size of the housing backlog and the desperation and impatience of the homeless, but stems also from the extremely complicated bureaucratic, administrative, financial and institutional framework inherited from the previous government' (DHS 1994: 1–2).

Since then the government has made some progress, but the housing deficit remains large and problematic. An emerging trend has been the recognition of the linkage between housing and sustainability. In 2010 the cabinet extended the mandate for the DHS to that of 'creating sustainable human settlements and improving the quality of household life' (www.ecdhs.gov.za). The project

is not directly linked to the national DHS, although it is aligned with its aims and policies. Nor is it directly linked to Council for Scientific and Industrial Research (CSIR) projects on built environment and sustainable human settlements, which are prominent publically funded research projects with similar goals.¹¹⁸

In contrast to public support for the notion of sustainable settlements, in practice the government actors involved in the network have played largely problematic roles. The various government actors involved are either uncoordinated or at loggerheads with one another. The paralysis that the university interaction is seeking to end is a direct result:

People have been living here in these squatter camps for 15, 18 years and they've basically been promised development in the conventional sense that government will put in bulk infrastructures, sewerage, water etc. build RDP houses etc. but the municipality was actually interdicted from doing that development because it's an indigenous forest. So one government department interdicted the other government department.¹¹⁹

The provincial DHS is responsible for funding the project. The DAFF, on the other hand, has played an oppositional role, seeking to prevent any human development in the area in order to fulfil its mandate to protect the indigenous vegetation in the area. In 2011 the DAFF gained an interdict to prevent any development in the area without the approval of an environmental impact assessment.

The metropolitan municipality is an important actor in that it is responsible, ultimately, for implementing the process of building houses. In its 2009/10 Annual Report, the municipality notes that their challenges with regard to the 'development of sustainable human settlements' are aligned with the research team's objectives, and there is convergence between their research and municipal priorities.

Private actors: the landowner

The land on which the informal settlement is built is privately owned, apparently by an absentee owner who is resident abroad. There have been ongoing discussions between the municipality and the landowner over the possibility of purchase by the municipality for the purpose of development. Meanwhile, the owner does not appear to have any problem with people living on his land. No rent is paid, and no services are delivered.

Interface structures

Interface structures at the comprehensive university

The notion of 'academic engagement' across a spectrum of outreach, professional service, teaching and research was one of the driving themes for the newly formed comprehensive university. The university had formal internal and external interface structures and a range of mechanisms to promote and coordinate engagement, reporting to a deputy vice chancellor. The extent to which these shaped the approach and practice of individual academics and departments was, however, embryonic and fragmented. For example, the project leader experienced difficulties bringing another cognate faculty into the project, because the academics reportedly had a kind of elitist attitude that prevents engagement with marginalised communities:

¹¹⁸ From interview with project leader

¹¹⁹ From interview with project leader

*It was so weird trying to get the faculty of architecture to come in on board, but we've had some difficulties ... We're struggling to get them on board, they say they're too conservative, they don't do projects really with poor communities, the students are sort of separate from that.*¹²⁰

The typical engagement stance prevailing amongst academics in the university was described as 'charity' rather than reciprocal community engagement:

*... the university has transformed a lot but a lot of the community engagement which they do I'm very critical of because it's sort of welfare work, where you get you know the social work students to go out and help run a soup kitchen. It's fine it's charity work, there's nothing wrong with it, but it's very different approach from this kind of research or participatory development where the community members themselves are actors, and researchers and documenters and decision makers.*¹²¹

The core academic department's research and engaged agenda is aligned with the institutional interface structures for engagement. However, the linkage with the informal settlement arose from the project leaders' own research and the external recognition of its potential value. She explained it in these terms:

*This came from another relationship with Human Settlements and with Derek Hanekom and so on. It didn't come from the university saying 'you know you must go out and do something relevant'. It came from my own research interest and the transition network interest and the Municipality pushing us to get involved here because they need a solution in this situation, so it didn't really come from the university.*¹²²

Interface structures in the community

In practical terms, the interaction between the community and the university team occurs through a planned series of meetings and workshops. In the action research parlance, community participants are termed 'community researchers', as the engagement is designed to be participatory in the full sense of including community members as researchers and intellectual contributors. The participatory workshops include about 40 community members. The team of community researchers comprised a group of five individuals – two women and three men. They also serve on a community policing forum and are members of a street committee, forms of popular participation in local government structures. They were elected as community researchers because they were already in leadership positions and were used to communicating with members of the community and with actors from outside. People who serve in such community structures are usually those who are deemed to have knowledge of political issues (though not always). This is so because they usually assume the role of community liaison with the municipality and other relevant structures.

Interviews with community researchers highlighted their communication role in reporting to the rest of the community:

*We, the community research team, report back to the community so we have to know exactly what to do and what to say to the community because we are going to face a barrage of questions.*¹²³

120 From interview with project leader

121 From interview with project leader

122 From interview with project leader

123 From interview with community participants

Government interface structures

The primary government interface is at the municipality level. Other government actors play a hands-off role – the DHS in a funding capacity and the DAFF in an environmental protection capacity. There is also evidently a communication gap between the community and DAFF: *'Department of Forestry people are very far from the community, they are not talking to each other.'*¹²⁴

Fieldwork highlighted a problematic relationship between the residents of the informal settlement and the municipality. The community is clearly frustrated with the municipality. The project leader also expressed the difficulty of engaging with the municipality, where interface structures are clearly deficient. Their attempt to have a single channel of communication with the municipality has not yet been successful. The municipality is apparently conservative in its approach towards construction and engineering, and is resistant to the changes that the project is trying to bring about. Overall, different factions within different government structures follow competing objectives and send the community mixed messages, which results in frustration.

Problematic interface with the municipality

*There is a problem between the residents of this area and the municipality. I mean you know politics and politicians they are never clear in what they say, instead they politicise everything. Well then I think that is where the research comes in. It seeks to get an understanding of what exactly is going between the municipality and the residents of this area. The municipality says there are trees which we cannot chop down and we do not know which trees are preserved. Nobody from the municipality comes and talks to us. They speak from their offices.*¹²⁵

*The municipality comes and addresses the community and the community shout at the municipality and say, 'where are the houses, why aren't you doing anything, what happened to the budget for this, what happened to the how many million or billion or whatever was allocated for this development' and I've been at a number of these meetings and I've observed it.*¹²⁶

*Municipal officials, who are meant to be community development workers or community liaison, and who are just absolutely arrogant and do not communicate with these settlements and you know, you treat them with derision.*¹²⁷

*It's a challenge [having] a lack of proper communication channels with the community and municipality. In the municipality there are so many sub-directorates and ... the one person who may not be the right person ... it's a problem we try to resolve because it's so important for this project that we have a proper communication. Therefore we asked the municipality to have one person who coordinates the response from the municipality and knows exactly what's happening here and here we ask the municipality to talk to the research team who is really has been elected as mandated by the municipality then that is the way we try to resolve that problem, which is not easy.*¹²⁸

The municipality they also have sort of old-fashioned engineers and so on who are resistant to these new technologies, like solar for example, they very reluctantly have put three solar lights here which you can see outside here, and then we say 'okay, we want to look at putting solar panels on shacks which will provide for running lighting and running a television or a radio whatever, it's quite possible.'

124 From interview with project leader

125 From interview with community participants

126 From interview with project leader

127 From interview with project leader

128 From interview with project leader

Oh, no-no, but then the shack needs to be stronger the roofs need to be supplemented and so on. So, okay, well that's possible that can also be done, but then they say if you do that then everybody will want it. So we say well what's the problem, no cost, cost we can't afford it it's too expensive. So there are all kinds of resistance being put up but we want to actually see if it does work, what the costs are, you know where we can access cheap solar systems suitable for shack use. It's there; it's got to be there in fact.¹²⁹

There are different attitudes and they fall on different sides of the issue and they are encouraging different strategies from within the community.¹³⁰

Drivers of interaction

From the university point of view, the primary drivers of interaction are intertwined intellectual and social objectives, which are anchored in the person of the project leader, who is the main intellectual actor and also the driver and networker of the project. The project leader is passionate about participatory research, and selected an action research model to operationalise this. The action research model enriches her intellectual work, to understand and develop strategies for sustainable urban settlements. From the project she has published reports and has written scientific papers. At the same time, the interaction achieves her social objectives – to achieve practical results with respect to socio-economic development for marginalised communities. Financial imperatives do not seem to play a role, except in the negative sense in that a shortage of funding acts as a limitation to achieving intellectual and social goals.

The approach of the community has been proactive, beginning with the service delivery protest during which they voiced their grievances to local government, an agitation that resulted in public financing of research to solve their problems and the interaction with the university. The community has consistently selected strategies in response to changes in their environment, led by a small group of individuals who appear to be leadership figures in the community. The community, through these leadership figures, has countered efforts to relocate them to another area, and has broken through the barrier created by government marginalisation of their plight.

The action research model is strongly participatory, and gives community participants an opportunity to take a proactive stance towards all aspects, including the identification of problems, specifying the research process, conducting field research to gain new empirical knowledge, assessing options for solutions and, in future, also in the implementation phase.

Innovation

The innovation aspects exist on the boundaries of the definition of innovation. Issues related to earning a living or of job creation are not the direct focus of the interaction, although it is planned that some of the innovative solutions identified will enable community members to earn a living (Cherry & Lemerrier 2013). In the most general terms, evidence that their community is environmentally sustainable will help them to maintain their position, and resist government attempts to relocate the settlement. As in the case of the fishing community, relocation would undermine their livelihood prospects as it would geographically remove them from their main source of employment opportunities.

¹²⁹ From interview with project leader

¹³⁰ From interview with project leader

At the time of research, the exact nature of the technologies had not yet been fully determined, and the academics were still in consultation with community members about which technologies would be most suitable. For example, new techniques for food production are proposed, focused on organic sustainable permaculture in local gardens. Proposed renewable energy technologies include solar power as a source of off-grid free renewable energy. The proposed sustainable sanitation infrastructure is bio-digester toilets connected to ventilated pit latrines and composting systems. The proposed sustainable construction technology is that of sandbag houses – a low-cost and environmentally low-impact form of housing based on the use of sand-filled bags as a construction material set within a prefabricated aluminium frame. Proposed water harvesting measures include tanks to capture rain water. None of these technologies are new to the world, but they would all be diffused to a new community. The origins of these technologies are diverse, but generally stem from local and international best-practice models that have been identified as a result of the academic partners' research orientations. The project leader noted that technological adaptation is not required, as all the technologies have been proven elsewhere.

The NGO members highlight that in sustainable settlements, these technologies are inter-related:

Waste management could be connected with composting and recycling projects. The composting could then assist food production, or propagation of indigenous plants that feed into a biodiversity rehabilitation project in the area. A woodlot could supply building materials for their homes, or firewood for rocket stoves that could be built with recyclable materials. And in all these different elements or functions are opportunities for sustainable livelihoods for the people of the community. (cited in Cherry 2012b: 7)

Permaculture gardens can help the community to produce its own food and possibly sell excess in the marketplace. The current food-production methods allow for limited subsistence only: *We have no proper irrigation so cannot even sell our produce. It is just for our own consumption – for subsistence.*¹³¹ Providing free renewable energy would reduce pressure on limited incomes. Paraffin for heating, lighting and cooking is currently one of the main expenditures for households.

There are also aspects of organisational innovation. The interaction has led to the establishment of a committee structure, albeit one that replicates existing committees for security and local political representation.

Knowledge and skills

There are several facets of bi-directional knowledge generation and transfer, some of which has already taken place, but most of which lie ahead in the future phases of the project.

Some of the skills development activities have taken on the traditional characteristics of a uni-directional flow of codified knowledge from the university partners to the community partners, for example learning about new technologies, or basic organisational training. However, from the first phase, the action research methodology involved the community in a substantial amount of knowledge co-construction, in which the community members are involved in most aspects of the research. This includes feedback about their problems, choices and solutions, which feeds back into the research process as a source of knowledge for the academics, for example the mapping of institutional relationships experienced by the community. Community members are also involved in

¹³¹ From interview with community participants

primary research, for example participating in physical mapping exercises to create knowledge about the terrain:

We have a base map which is contour map and on top of that we built up the story of the plot with regard to vegetation and soil, then we draw what is existing there on a transparent, then the following transparent is the story of water, erosion, high ground water level and different things related to water, possibility of harvesting and storage and all that. Another one is about the wind, measure wind and sun and all that ... We'll do that together and we build ... that gives you the idea of where not to build, where to put the water, where to plan things ... and from there we learn where to build different infrastructure ... it would be about vegetation, we are going to go together and try to identify different trees and to identify the aliens and to plot them on the map, it's very practical.¹³²

Community participation

The process of action research is powerfully participative, and to an extent is a kind of model or benchmark by which participation can be assessed. Field research, which occurred on site during a collaborative meeting between university researchers and community participants, revealed the strong personal relationships and trust that have developed, and that community members are playing an active role in practice as well as in principle.

Internally, community participation takes on a democratic character, in which the committee is elected and reports back to the community. Community participation is also sensitive to the role of gender. The community participants interviewed had a clear sense of their role as agents in the research process. The participative and horizontal nature of the interaction with university researchers was perceived to have a positive effect on their relationship.

Voices on community participation

It's got its own leadership committee which are meant to be elected although I'm not personally involved in their process of electing their leaders, but those community committees mandated particular individuals to be on this community research team.¹³³

So things like bringing bio-digested toilets or setting up pellet houses with solar lighting and whatever just to get the residents to be exposed to the possibilities and to make choices about what works, what they want to use, what is most efficient, what is cost effective for them, what will meet their needs most effectively and so on. They are not bound to that as a long-term solution but it's an exploration.¹³⁴

We had men and women so that you can see whether there are different priorities ... for men and women ... women certainly they are more eager about water and sanitation, while men are more job and women daycare and playground for the kids.¹³⁵

We identify problems on our own. We discuss them in our community meetings and we would go to the university group for assistance or advice if we need it. We would discuss it with them, analyse it and go back to the community. But the bottom line is that we, the residents, have to come up with the solution.¹³⁶

132 From interview with project leader

133 From interview with project leader

134 From interview with project leader

135 From interview with project leader

136 From interview with community participants

So far we have not faced any challenges [with respect to the relationship]. There is no boss in what we are doing. We are all equal. I think that is part of the reason why we still get along well. They do not act as though they are professors or bosses. They come down to our level.¹³⁷

Outcomes and benefits

Assessing benefits is complicated by the fact that the project is still in its early stages, and most of the benefits lie in the future rather than the present or the past. As such, in Table 7.1 below, the distinction between existing and potential future benefits is highlighted.

At present, the main benefits for the academic partners have been the production of academic outputs (papers, reports, conference presentations) drawing on their experience in action research. As the project proceeds, this experience and its related outputs may lead to the outcome of building a knowledge base related to the theory and practice of sustainable settlements for marginalised communities. The main benefit for the community partners has been the establishment of a committee structure for engagement with academic and government actors. A less tangible but very critical outcome of the interaction is the motivation and cohesion in the informal settlement community, conceivably facilitated by the participative methodology of the project:

... it's a fantastic challenge, because there can be such a positive outcome and ... the people who live here, they want to do things, they want to have rights to, they want to be secure and they want to have lights and try building methods and get things done you know, so it's quite a cohesive and motivated community.¹³⁸

The potential future benefits include the establishment of a sustainable settlement, including environmentally sustainable food, energy, sanitation and construction technologies that could positively impact on livelihoods. It is also possible that the skills developed through the engagement lead to employment in the future. Ultimately, it may be the case that the demonstrated sustainability of the community prevents it from being relocated to a site away from its primary source of livelihoods. The potential for scaling up is very large:

If you think of the number of informal settlements in South Africa that need upgrading or development or whatever service provision it's, you know, hundreds and thousands. The potential is enormous but it's very surprising that that sort of technology we don't see very much scale up scheme in South Africa.¹³⁹

It is possible that the implementation phase will never be reached, perhaps because of a lack of funding, or perhaps for unforeseeable political or organisational reasons. The current paralysis caused by conflicting and uncommunicative interest groups in local politics, for example, is a potential constraint:

One huge challenge is local politics, local government, different government departments, tension within and between them ... it is fraught with tension, it is so difficult to do anything, and it's within the ANC, it's between the ANC and opposition parties, it's between councillors and municipal officials, it's between different factions of councillors and different factions of municipal officials, and it really paralyses things in a way ... you can't do something because you work with one office for one person but then it gets undermined by another office ... it's very problematic because we not here as political

137 From interview with community participants

138 From interview with project leader

139 From interview with project leader

activists, we're here, you know with a specific research and development agenda, but it gets tied up in those problems ... So we are basically trying to hold all the parties together, into one game and say okay, like keep on working out, you know, you got to.¹⁴⁰

TABLE 7.1 Outcomes and benefits of the interaction between the comprehensive university and the community

	Informal settlement actors	Comprehensive university actors
Outputs	Possible future outputs: Establishment of a sustainable settlement, including environmentally sustainable food, energy, sanitation and construction technologies	Research outputs (papers, reports, conference presentations, postgraduate dissertations)
		Experience and theory of participatory action research
Outcomes	Establishment of a committee structure for engagement with academic and government actors	New knowledge regarding the establishment of sustainable settlements for marginalised communities
	Possible future outcomes: Improved livelihoods from permaculture gardening practices/renewable energy technologies	Possible future outcomes: Building of a knowledge base related to the theory and practice of sustainable settlements for marginalised communities
	Possible future outcome: The relocation of the community is prevented by its demonstration of viable sustainability	

Conclusion

This case is primarily characterised by social innovation – both in the sense that it focuses on socially embodied change rather than physically embodied change, and also in the sense that it is aimed towards improving livelihoods but not primarily doing so through market mechanisms. The action research methodology frames the nature of interaction, knowledge generation, knowledge transfer, and ultimately also innovation and its utility in terms of livelihoods. The community has elected leaders who have taken strategic decisions in response to changes in their environment and have engaged with other actors on their own terms. The project is worth following over time to assess the realisation of its potential and the possibilities for implementing the model on a wider scale.

Enablers and constraints

The main enablers relate to the participatory action research methodology adopted for this project:

- National housing and human settlement policy provides an enabling framework
- Research funding from provincial government has made the research possible
- The local municipality's long-standing interaction with the comprehensive university and openness to work with the university as an intermediary partner to inform its interaction with local communities to deliver essential services

140 From interview with project leader

- Engagement incentives or interface structures at the university are not direct drivers nor do they provide direct support, but the well-established engagement ethos of the university supports the integration of the project into the academics' core research and teaching activities
- The academic base of teaching and research in the field of human settlements and development that provides a core of relevant expertise within the university
- The intense commitment of the academic project leader to work directly with the community using a participatory model
- The technological expertise of the NGO that can provide a range of possible technological solutions for consideration regarding their appropriateness for the task
- The social innovation of the participatory approach to interaction that has built up internal interface structures and stimulated community agency
- The focus on mechanisms and processes to facilitate flows of codified and tacit knowledge.

The constraints relate largely to the political dimension and the contestation around scarce resources, as well as the demands of the action research methodology:

- The lack of policy coherence between the goals and priorities of different government departments at national, provincial and municipal levels
- The formal commitment to develop holistic and comprehensive approaches to sustainable human settlements, but the lack of competences to implement such on the part of local government
- Potential conflict between local interest groups
- Funding for trialling the use and impact of different technologies is limited
- The gap between institutional strategic policy and the prevailing ethos and practice within the university, which constrains the recruitment of complementary expertise in other departments
- The social, political and academic skills required to use an action research participatory model effectively.

Enablers and constraints on innovation to enhance livelihoods in informal settings

The strategic goal of the UNIID project is that we should promote more academic and university involvement in innovation around informal livelihoods with marginalised groups, to contribute to the national priority of inclusive development in African contexts. Hence, the research question was posed:

What facilitates and/or constrains interactions between universities and marginalised communities that promote innovation to enable livelihoods in informal settings and support inclusive development?

Here, the use of case studies is of value, and has limitations. It is of value, as we are building a rich empirically contextualised evidence base, against which we can interrogate our working conceptual definitions critically, and contribute to the emerging research literature on innovation for inclusive development. It is a limitation, given the diversity and the broad scope of our case studies. We do not have a depth of evidence on all the critical dimensions, and we do not have enough comparative cases to generalise with full confidence. Therefore, to identify determinants of interaction between universities and marginalised communities will only be possible through a comparison of the full set of cases from all six countries participating in the UNIID project.

This chapter thus aims to highlight preliminary patterns and insights contributed by our empirical analysis in the South African context. We first consider how each case represents innovation by and for marginalised groups, and then we identify enablers and constraints.

Two broad patterns of interaction

We found that it was not easy to identify cases for empirical study. The forms of interaction that enhance livelihoods in informal settings are rare across the South African higher education landscape. Community-based enterprises, co-operatives, social enterprises and individuals engaged in survivalist economic activities in the informal sector are not commonly beneficiaries of university knowledge and technology. It was more common to find instances of university academics extending their knowledge in relation to the *quality of life* of marginalised communities (here livelihoods refers specifically to means to earn income or subsistence, while quality of life refers to broader social goods, such as security, sanitation, education and so on). For example, low-cost water purifiers were developed by university scientists using nanotechnology, or scientists develop cheap and sustainable solar energy systems or new low-cost technologies for sanitation that can enhance the quality of life of marginalised communities. These technologies are produced as socially-oriented research, but the academics,

and their universities, typically remain at a distance from the diffusion and adoption of these new technologies in marginalised communities. A linear model of innovation tends to prevail, and there are few mechanisms for community participation at the problem identification and design stage.

Four cases – and two contrast instances – were identified and analysed in rich detail, revealing many complexities and contradictions. It is evident that each is strongly responsive to the specific socio-economic development challenges that are the legacy of the long history of colonial oppression and apartheid in South Africa – whether to livelihoods of impoverished pastoralists and fisherfolk in remote rural areas, or to the livelihoods of impoverished communities living in informal urban settlements. When we compare cases, we can discern two broad types of interaction:

1. Where the academic/university interacts indirectly, at one remove, in terms of ensuring community access to livelihoods. This form of interaction involves the university in networks of multiple actors with complementary expertise: the fishing community and informal settlements projects. In these cases, capability-building includes the development of ‘political capabilities’ or the capability for engaging with political authorities that seek to further marginalise these communities.
2. Where the academic/university directly interacts by introducing new processes or products to community survivalist livelihood activities. This involves the university in partnerships where the main channels of interaction are student interns or local development actors funded by the university: the women’s sewing collective, soya co-operatives, indigenous cattle co-operatives, and the agricultural park.

This distinction is useful, in that it points towards two important distinct aspects of marginalisation that can be addressed through knowledge partnerships with universities – namely livelihood access (which is threatened in marginalised communities) and livelihood improvement (which is also an imperative in these communities). In what follows, we use this broad typology to structure our discussion.

Innovation by and for marginalised groups in informal settings

In Chapter One, we drew on Cozzens and Sutz (2014) to argue that innovation for inclusive development requires that interaction should involve the participation of communities as active agents, and that the outcomes should be to the benefit of the community. We pointed out the difficulties of defining, and particularly measuring, livelihood benefits. Assessing outcomes and benefits for communities requires a separate study on its own. For our purposes, we proposed that livelihood benefits should add social and environmental value to the community, and should be sustainable over time. In addition, we drew on the development studies literature to emphasise that interactions should have the potential for scaling up and diffusion. Our focus on the role of universities as intermediaries means that interaction should be of benefit to academics as well, and address their substantive concerns with knowledge generation and building academic reputations. This raises the question of how our cases could be interpreted in terms of the ways in which they display these critical features.

Interaction to ensure community access to livelihoods

In the fishing community case, social and environmental value resulting from interaction with the university academics is considerable. It has enabled a fishing community to protect their livelihood and the estuarine ecology over an extended period, for the past 20 years. Research capacity building has provided a base for the community to continue to fish sustainably, and to explore alternative sources of future livelihoods on a proactive basis. The scale is small and localised, but potentially replicable, evident in the improved multidisciplinary understanding of the social and environmental aspects of estuarine management, which can be of value to similar communities in other areas. Likewise, the

insights into processes that increase community capacity to participate in environmental management processes can be of wider value to replicate in other communities. The degree of active participation by the community is significant, in driving the agenda for interaction, in participating in research, and in identifying solutions, and has resulted in new organisational forms and direct involvement in national decision-making forums. The benefit to the university in terms of building an academic field, growing a research unit and developing postgraduate students was substantial.

The informal settlements case was only in the early initiation stages, but had already contributed to growth of the academic field within the university. The intention is clearly to add social and environmental value at the same time as protecting the communities' access to livelihoods. The processes to promote agency and active participation on the part of the community have been carefully planned in terms of a systematic approach to build capacity. Signs are that the action research methodology and the integrated approach to sustainable settlements have the potential for up-scaling and, as in the fishing community case, may provide multidisciplinary knowledge and processes that can be replicated in other informal settings. Efforts to add environmental value are integral to the approach and focus of interaction, but we await future evidence as the project proceeds.

These cases thus have the potential for mutual benefit. They feature learning and technological capability building on the part of (some people in) marginalised communities, and extensive academic learning, interactive capability building and knowledge generation. The nature of innovation at the heart of the interaction, however, is limited, particularly in terms of technical innovation. However, there is evidence of organisational innovation in both the cases, and the potential for future technical innovation, particularly in the informal settlements case.

Interaction to introduce new products or processes

Most of these forms of interaction have had limited livelihood benefits, in terms of moving individuals away from survivalist activities and towards more sustainable income-generating opportunities, or connecting them into informal or even formal sector value chains.

The indigenous cattle co-operatives case has the strongest degree of replicability. It is replicable in terms of the reach to 72 communities in the local province, as well as the initiation of schemes in five other universities, so that it operates in seven of South Africa's nine provinces (albeit with varying degrees of success). Community participants reported improved livelihoods as a result of improved performance of cattle herds, and of increased absorptive capacity for new technology within their impoverished communities. Increased social value was reported by the community, in relation to an increase in the financial resources available for education and enhanced opportunities. Increased livelihoods are potentially sustainable over time, in the model of co-operatives 'gifting' cattle born of their herds to other clubs. Research capacity, niche expertise and skilled graduates have benefited the university.

However, the number of 'gifts' passed on reportedly remains low, and is variable between schemes. The potential for linkages to formal markets for organic beef and leather was recognised, but not (yet) realised. There was a very low degree of active participation in innovation processes by the local farmers and co-operatives. Communities are invited to take part in what we may call 'participatory diffusion' processes, but are largely uninvolved in knowledge processes, are fairly passive recipients, and evidence suggests little depth of learning about the new farming practices required to renew herds successfully. The university conceptualised and managed the project and controlled funding without community participation or accountability.

For the women's sewing micro-enterprise case, undoubtedly, university interaction has enhanced technological upgrading and improved livelihoods and this has been sustained over more than five years. However, the livelihood opportunities and social value added to the lives of unemployed women is very limited in scale. The reach of the social enterprise remains very small. Access to formal markets remains a challenge, with more success in accessing informal-sector markets. To date, there has been no attempt to replicate the interaction to other groups or settings. While there has been mutual learning and the interaction is driven by proactive strategies of the social enterprise, this tends to be concentrated in a single leader. There is little evidence of active participation on the part of the women who are members of the social enterprise, other than participation in training and capacity building, although mutual learning between students and marginalised women has been a strength.

The soya co-operatives case has a stronger degree of agency on the part of the leader and key participants. It has reportedly added more social value to the participants' lives, given the success in accessing informal-sector markets. The 'innovation' – the establishment of soya manufacturing processes and business models in new contexts – has been replicated in more women's groups in other locations, also over an extended period of time. There is very little academic contribution by and benefit to the university, however, and the kinds of consultancy services offered by the technology station are so basic that they can barely be defined as innovation or, indeed, academic.

The agricultural park attracted extensive funding from provincial government economic development programmes, and was widely cited as a model of good practice by the university leadership. However, there had been virtually no social or environmental value to participants to date, nor were they actively involved in managing the co-operatives or participating in the project. The academics were not directly involved, having appointed project managers to interface with marginalised communities. There was little knowledge generation and limited student learning. The interaction took the form of a more traditional service or agricultural outreach to the community, and was not linked to substantial academic research. The possibility remains, of course, that, over time, the main blockages – the absence of linkages to formal or informal markets, the lack of alignment with academic concerns and the lack of community agency – could be addressed.

Agency and benefit

The working definitions of agency and benefit were critical to the study. It is evident that our measures of agency, in terms of participation in all stages of the process and, in particular, bi-directional knowledge flows, are workable. However, agency took on a number of different forms, and establishing the extent and nature of agency in each case required careful interpretation of the data. For example, it was necessary to clarify the manner in which communities exercised agency in terms of their relationships with university partners, in terms of their contribution to framing problems and finding solutions, and in terms of retaining the freedom to make choices about implementation. The measures of benefit are more complex, and will require much more empirical evidence, and further conceptual elaboration. For example, more data are required to assess the potential for scaling up and replicability, and to quantify the nature of benefits that are created *by* communities, on the one hand, and *for* communities on the other.

Enablers and constraints

Throughout, the analysis highlighted how 'skilful but imperfect rational' academic actors and university organisations, government actors and agencies at various levels, community-based and co-operative actors and organisations, have been driven to interact with one another, to learn, innovate and develop

new competences that promote livelihoods of marginalised communities (Lundvall 2010: 331). The task now is to distil the conditions that facilitated or constrained these two distinct forms of university interaction by and for marginalised communities.

Alignment with national and regional policy processes

Alignment with national and provincial policy imperatives and processes could be a critical enabler, or even a driver, of interaction.

The technology stations initiative was supported by the national Department of Science and Technology, and led by the Technology and Innovation Agency. In the soya co-operatives case, an entrepreneurial champion literally talked her way into provincial government offices to secure funding and markets for her co-operatives. The indigenous cattle co-operatives model captured the imagination of a national development funding agency, and aligned with the agenda of provincial departments of agriculture, which meant funding and expansion of the model to other provinces.

In the informal settlements and fishing community cases, more indirectly, academic postgraduate programmes were built up, and aligned with the national priority accorded to the development issues of sustainable human settlements and fisheries, given the lack of an evidence base to inform policy and implementation.

In contrast, the agricultural park case highlights the negative effect of a lack of alignment with key regional policy processes. In this case, the business model was premised on public procurement policy, but the project leaders failed to conclude a formal agreement with provincial government. When procurement processes changed, the co-operatives were not equipped to access public sector markets on a competitive basis (and this can largely be attributed to the lack of a deliberate strategy to develop the capacity for agency).

Government agencies – at national, provincial or regional level – acted as key public intermediaries in most of the projects. They provided funding in the informal settlements, women's sewing micro-enterprise, soya co-operatives, indigenous cattle cooperatives and agricultural park cases, and were directly involved as intermediaries in the interaction in a range of other ways. In the indigenous cattle co-operatives case, government agricultural extension officers played a key brokerage role, linking farmers to the project, as did local government agencies in the informal settlements case.

Government agencies could also be adversaries, however, as in the fishing community case, and in the informal settlements case, where contestation between government agencies at different levels with differing mandates led to major blockages and delayed the resolution of threats to the livelihood of the communities.

University drivers: the key role played by individual actors and intellectual imperatives

One perhaps unexpected trend that emerged is the critical role played by individuals in the universities and in the communities, as champions of interaction and innovation.

Academic champions, committed to social development (across the ideological spectrum), and driven to grow their academic disciplinary field through the processes of interaction with communities, made a critical difference. Initiation and the focus of interaction in the fishing community and indigenous cattle co-operatives cases were primarily driven by the intellectual imperatives of the lead academic.

Interaction was sustained over time because it fed into their research agenda and grew their academic field and reputation. Similarly, in the informal settlements case, the lead academic played a key role in determining the shape and form of interaction, although the impetus to initiate interaction came from the municipality, and organisational support structures were more advanced in the university.

Of note is that each of these cases was initiated prior to the intensification of national debate around community engagement and social innovation, and the national policy imperative to institutionalise structures to support engagement. In the research, comprehensive and rural universities, the prevailing strategic ethos encouraged interaction, but university structures did not drive interaction directly, in the sense of initiating or brokering a linkage. The exception was the university of technology cases, where individuals in the newly established technology stations actively sought community-based partners to fulfil their mandate within the university.

Nor did university structures provide active or extensive support in the form of university funds, resources or specific expertise required to facilitate the interaction. The lead academic built networks to bring in missing expertise critical to the project, such as legal advice for the fishing community, or agricultural extension officers for the indigenous cattle co-operatives. This was a potential blockage, for example, the lack of funding meant that collaborative projects could not progress.

The form of interaction was, however, strongly influenced by the university mandate and strategic direction. For example, at the research university, the interaction was strongly oriented to research with traditional knowledge relations, and slowly evolved into a bi-directional, mutually beneficial network. The rural university was well placed to initiate a network with local communities, extension officers from DAFF, national funding agencies and agriculture students to ensure the effectiveness of the indigenous cattle breeding, given its strategic mandate. However, this tended to retain traditional features of community service learning and agricultural extension types of relationship.

With its applied technology mandate and commitment to work-integrated and service learning, in contrast, interaction at the university of technology took the form of technology transfer to SMME partners. Academics' role in the interaction was formally mediated through an external interface structure, a technology station funded by a national government agency. The formal structures pushed individual academics to actively identify and interact with actors in SMMEs, and provided facilities, funds, technology and human resources to attract external partners and support innovation. The design and prototyping services offered are specific to universities of technology, and are not typical of research universities.

Community drivers: proactive strategies

In an almost mirror reflection, individuals from marginalised communities played a key role as champions and intermediaries between the academic and university interface structures, and the larger community-based groups. The initiation and main point of contact throughout the women's sewing collective and soya co-operatives interactions was a single community leader who possessed the entrepreneurial skills critical to engage with academics. The proactive role played by the entrepreneurial community leader seemed to make a difference by extending the soya-mixing co-operative model beyond the original group. The leader of the women's community organisation was initially driven by a proactive strategy to initiate the interaction but, over time, was driven by more passive strategies related to the immediate challenges of the social enterprise. In effect, the community leader worked with the university of technology in a series of dyadic consultancy and contract relationships.

In the research university, where the external linkage was less structured, the academic set in place a process of social innovation to elect a committee that would represent the community and provide a formal link to the university and other actors involved. The fisherfolk and the threatened informal settlement community elected a committee to liaise with academics, which allowed them to be driven constantly by the communities' proactive strategy. The proactive strategies of the community partners were weak in the indigenous cattle co-operatives and agricultural park cases. Community members largely responded to the university initiative in their own (or their co-operatives') short-term interests. Each co-operative essentially entered a dyadic contract form of relationship with the university, and did not participate in the wider network.

The nature of community participation and knowledge flows

This suggests that the nature of the drivers of the interaction is closely connected to the degree of agency and active participation, with passive community strategies leading to a more limited, passive role as recipients, and proactive strategies facilitating agency. So, the agricultural park case is one where community actors had little role to play in setting the agenda or devising the business plan. The project was driven by academics attempting to extend the ideal model of an incubator to a rural context. Knowledge flowed from the university actors to the co-operative members, and learning was limited to the specific economic activity, such as running the nursery or using the manufacturing equipment. A lack of agency resulted, and the community actors were not able to be proactive in identifying and accessing alternative markets.

The soya-mixing case provides an illuminating counterpoint where, essentially, the academics provided consultancy services to the co-operatives. Here too, knowledge flows were largely from the academic actors in the technology station to the co-operatives represented by the dynamic leader. There was little direct interaction or bi-directional flow of knowledge. However, what is different is that the community leader was an active agent, identifying that the university could assist her group, and actively seeking out the required expertise to proceed at key points, whether in relation to identifying recipes so that the women could begin independent production to their own benefit, or in relation to complying with food safety regulations so that the project could find larger markets. Distance was not a deterrent to seeking out the academics to learn through interaction. Uni-directional knowledge flows and consultancy forms of interaction can be of value, if learning and capacity building is taking place.

The fishing community case reinforced the significance and the demands of fostering community participation. The academic leader reflected how, over a long period of time and interaction, the university team learned to work in a different, more participatory way with the community, based on recognition of the value of the community's tacit knowledge. The challenges of social innovation to build interface structures within the community to facilitate agency and linkages to the university are time-consuming and considerable, however, and, in many cases, the academic appointed other intermediary actors as the direct contact point and interface.

The role of intermediaries and networks

The role of intermediary actors in the network forms of interaction was thus revealed as important, particularly in relation to the diffusion or adaptation of existing knowledge and technologies within communities, and as the direct channel of interaction.

The interviewees stressed how the processes and dynamics of building relationships with communities could become a blockage. Many academics do not have the skill – or the time and resources – for such engagement. In a number of cases, students and interns or intermediary actors such as project

and extension officers were the main channels of interaction, bringing codified knowledge from the university, engaging on a daily basis and, consequently, benefiting through tacit learning from the community partners. The academic leader operated at one remove to provide intellectual leadership of the project, control funding and be drawn in actively at key points to give direction and high-level support.

Intermediaries also played a key role in bringing in missing complementary expertise that the lead academic or the community partners lacked. The technology stations, for example, also operated as intermediaries to draw in academics in other departments as specific skills or capacities needed to be built, such as business, marketing or financial planning. It is possible that the agricultural park leader could have strengthened active participation by drawing in academics from other departments, who could work with the co-operatives to build their competences to manage and market the food products more effectively.

Thus, intermediaries served to enhance the flows of knowledge in networks, whereby community members' tacit knowledge could enhance the solutions developed to address livelihood problems, or to build capacities of community members. The informal settlements case, although as yet untested, exemplified the value of such an approach. The role of intermediaries in the direct everyday engagement with communities contributed to mutual learning and the capacity to replicate and scale up projects.

Funding

Almost all the project leaders mentioned funding as an issue, and would have preferred more steady access to financial resources and what these make possible. It was strongly evident that universities and national government do not provide sufficient funds for community engagement, which is an unfunded mandate. Even small amounts of funding could make a big difference, for example, funding students to travel to communities at a distance from the campus, or funding agricultural extension officers to support emerging farmers in their own contexts.

The technology station was the structure that benefited most directly from government funding and, in line with policy and university strategic imperatives, was able to conduct work to the benefit of community livelihoods and SMMEs. However, this was not a guarantee of added social and environmental value over time, nor of replicability. Indeed, funding is no guarantee of 'success', as the agricultural park case also suggests. Analysis highlights that funding was not a problem, and that expensive facilities had been built, which were underutilised. And lack of funding is not a guarantee of 'failure' either, as the fishing community case attests – the project leader continued working intermittently with the same community over 20 years, as and when funding allowed.

Thus, funding may be a blockage that prevents more academics from interacting with external partners. It may facilitate ongoing interaction over time, and may shape the nature and outcome of interaction, but it is only one of a set of determinants.

Conclusion: reflections on universities and innovation for inclusive development

We now need to return to consider the potential role of the university and its academics in innovation for inclusive development, before addressing the strategic question of how we encourage universities and their academics to extend their scholarship to the benefit of marginalised communities. Finally, we reflect on issues and directions for further research.

Critical questions about universities and innovation for inclusive development

The lack of novelty in the innovations, the low technology or knowledge intensity of the solutions introduced, the prevalence of technology adoption and diffusion and the significance of social innovation led to critical questions being raised throughout the research – but is this innovation? Are these not simple diffusion projects that stretch the definition of the concept of ‘innovation’ so far that it can refer to any or every activity and, hence, is no longer analytically useful? And then, we questioned: Should universities be involved in this kind of innovation that requires low levels of scientific knowledge generation and transfer?

Is this innovation?

The nature of the technology and innovation required to solve a problem is a major determinant of university–industry interaction. Firms typically are driven to interact with universities because they need solutions that require very expensive equipment they do not own or cannot afford, or to access expert knowledge that their own R&D or technology development unit does not have, or to draw on expert knowledge that can complement their own work to create new solutions that do not yet exist, and so on.

What are the knowledge imperatives driving marginalised community groups or co-operatives to interact with universities? The innovation at the heart of these cases primarily relates to processes or products that are new to a co-operative or community operating in the informal sector, and as the soya co-operatives case highlighted, new to a marginalised social group that was previously excluded from accessing livelihood opportunities. As the social entrepreneur leading the group put it so eloquently, *‘It’s new because we are the ones now manufacturing it.’*

Clearly, the boundaries of what counts as innovation, defined as ‘a new product, or process or form of organisation for production’, were stretched. The indigenous cattle co-operatives case, for example,

reintroduced a genetic breed of cattle to marginalised social groups as well as the potential use of innovations in breeding (the artificial insemination project) that could enhance productivity to access formal meat markets. The community involved was persuaded that the new breed would enhance their herds, but the knowledge flows of this interaction focused very little on the genetics of the breed, and rather, more narrowly, on the requirements for effective husbandry and care. Similarly, the women's sewing collective case provided access to industrial sewing machines that was new to the social enterprise – but not to most other formal firms. It did, however, provide access to expensive high technology equipment to translate patterns to prototypes, which could enable product innovation and provide a critical edge in the market, not typically available in the informal sector.

The fishing community case introduced very minor process changes to fishing practices and, also, productive opportunities new to the community. However, it added social and environmental value in building the capacity of the community to seek new opportunities and learn to be more effective in an ecologically sensitive environment. We have also seen that a major set of changes introduced in most of the cases was new forms of organisation for production, in 'doing-using-and-interacting' modes. New knowledge was created in relation to the social processes required to ensure that searching for new opportunities, adapting and learning occurs on the part of community actors.

Thus, the cases suggest that the simple working definition of innovation as 'new products and processes' may be too limited to capture innovation in informal settings. Researchers such as Foster and Heeks (2013a and b) experienced similar problems in their research on mobile phone technology in Kenya. They instead coined a term 'innofusion' to capture the dynamics of innovations that are minor, specific to local needs and more related to social systems than to the technology itself. Others argue that innovation in informal settings may be better illuminated by a more comprehensive and nuanced definition of innovation. Marcelle (2014: 4) proposes a good alternative:

Innovation is an intentional process of generating, acquiring and applying knowledge aimed at producing economic and/or social value. In developing countries, this process typically takes place through the unfolding over time of a wide variety of learning and capability building processes, rather than through the mastery of science and technological knowledge. Innovation is an investment effort in which knowledge, financial capital, and other resources including cultural and social capital are deployed over time to create value. Deftly undertaken innovation can lead to the transformation of systems, values and culture as well as the production of new and/or improved products or processes.

Our cases point to the need to refine the notion of innovation so that it may be more appropriate for the developmental challenges of countries such as South Africa.

And (how) should universities be involved?

Is involvement in such projects the role of the university? If the distinctive role of the university is knowledge generation, and most of the activity with marginalised communities entails local technology adoption and diffusion, should the university be involved in livelihood-oriented projects? Is such work more appropriately the domain of organisations such as development agencies, government research institutes or local government actors, working in networks with academics? Diyamett (2008), for example, argues that in African countries, the scientific community faces a dilemma caused by a dichotomy between the universal internal logics that drive science systems, and local technology demand, at a much lower level. The role of universities in innovation and expanding 'knowledge frontiers' appropriate to local conditions is thus critical, she argues, proposing that other research institutes should be involved in lower-level technology development.

We have argued that at the core of universities' distinctive role in the national system of innovation is the generation of new knowledge. Clark (2008) highlights that the unique nature of universities relative to other knowledge institutions lies in the discipline-centred nature of academic knowledge production. Universities grow through development of their disciplinary knowledge base over time. As he argues: 'academic territories are first of all subject territories, even while they are clientele territories and labour market territories' (2008: 456). Substantive growth is led by knowledge and research generation, requiring postgraduate expansion and academic specialities. Whitley's (2000, 2003) work resonates with Clark's analysis, by defining the distinctive nature of universities as 'reputationally controlled work organisations'. The production of knowledge is structured by academics' competitive pursuit of intellectual reputations, judged by their disciplinary peers.

Hence, universities are likely to perceive interaction as of greater value when it is driven by their substantive academic imperatives – that is, when an interaction with marginalised communities is integral to the expanding knowledge base of a discipline, to the work of scholarship, and research-based teaching and learning. So, if academics are extending their scholarship, and new knowledge is being generated at the same time as a benefit to livelihoods of marginalised communities, then academic involvement in such interactions is valid, and likely to be valued. The evidence of our cases supports such an interpretation, in which the benefits to the university appeared to be greater than to the community.

Our analysis highlighted that the involvement of the university in a network such as the indigenous cattle collectives made a critical difference. It meant that it could have wider implications beyond the small group of actors directly involved, even in the scaled-up version. Indeed, the new knowledge generated from most of the case study interactions was typically not of direct relevance to the specific community. It was more likely to be of direct academic value, and could potentially be of policy value, to inform work with other similar communities. So, intensive work succeeded in protecting the access of some 200 fisherfolk to livelihoods, over a period of 20 years. However, the significant research published and the postgraduate theses contributed to the reputation of the project leader, and to growing the academic field. The engagement with government to develop future policy directives could have an impact on practices in many other fishing communities, as well as on environmental management in general. Likewise, only a few marginalised women in the sewing micro-enterprise may have benefited directly, but students learned and were trained, and the technology station gained valuable expertise that could be implemented in working with other micro-enterprises.

In reflecting on the sources of learning for university actors, it is clear that in most cases they learned by working directly with communities to collect evidence and experience for research production and training. It is, however, possible that they could have learned more if knowledge flows had been more bi-directional and knowledge had been more co-produced.

Our cases therefore place on the academic agenda that impoverished and marginalised communities are and should be potential users and beneficiaries of university knowledge, **alongside firms and government**. So, we began by pointing to the developmental challenge of growing inequality despite economic growth in South Africa. The policy argument for an inclusive economic trajectory is strong, positing that informal-sector activities should be seen as integral to economic development in South Africa:

Poor and marginalised people would thus *contribute* to growth, rather than just receive benefits from formal sector growth in the form of social spending or grants. (Fourie 2014: 4)

In the same vein, university interaction with communities does not have to take the form of philanthropic 'community service' or outreach. It can focus on innovation, on knowledge generation

and on technology diffusion, and it can be inclusive – by and for marginalised communities. The research provides support for science and technology policy developments towards a strategy informed by the paradigm of innovation and technology development.

Interaction can add value to the academic programme by providing significant sites of learning for students, particularly but not only in their professionally and occupationally related programmes. It can create a sound base for building an academic reputation and growing new disciplinary areas. The challenge lies in shifting the ways in which universities interact with communities, from passive recipients to active participants in mutually beneficial networks.

How do we encourage universities and their academics to extend their scholarship to the benefit of marginalised communities?

The policy priority in South Africa is clear – that science and technology should be harnessed not only to promote productivity and global competitiveness of firms, but also to address poverty and inequality and improve the quality of life of all citizens. The emphasis on the interaction between **skilful but imperfect** rational agents and organisations, for purposes of learning and competence building, pointed our research to explore the actors in a system, and the dynamics between them. The focus was on community, university, government and other intermediary agents and the organisations in which they are located, and on the flows of knowledge, resources and learning between them. The emphasis on drivers of interaction, types of relationships or channels of interaction, and outcomes allowed investigation of how the nature of interaction is linked with the benefits to all actors, particularly in facilitating innovation by and for marginalised communities.

What are the implications for university actors that can be drawn from these exploratory case studies, so that the evidence addresses the strategic question raised at the outset, and informs implementation of national inclusive development policy goals?

1. The need to translate the evident commitment to engagement and responsiveness into research and teaching activity for the use of and to the benefit of marginalised communities, alongside firms, government and other actors in the national system of innovation.
2. The need to ensure that interaction is driven by intellectual imperatives, that it is based on and extends academic scholarship so that it adds academic value and builds reputations.
3. The need to ensure that interaction is driven by the proactive strategies of active community-based agents, and includes as wide a base of participation as possible, so that it can add value.
4. A thorough analysis and understanding of the livelihood problems of marginalised communities is essential, which requires mutual learning and drawing on the tacit and indigenous knowledge of community participants.
5. Universities need to extend and integrate their experience in promoting and supporting research, innovation and technology-transfer activities, to interaction with marginalised communities. They need to enhance internal coordination and address the tendency to fragment research, innovation and community-engagement activities into discreet domains.
6. Universities need to create appropriate external interface structures that facilitate access of marginalised communities to university knowledge and technology.
7. Universities need to set up relationships with communities so that active agency is promoted and enhanced, which may be assisted by including other local intermediary actors in the networks to provide complementary and missing expertise.
8. Steady sources of funding as part of the government-subsidised mandate can encourage more academics to prioritise interaction with marginalised communities.

9. Alignment with provincial and local government initiatives can aid in replication and scaling up of models but processes should include community participants as active agents.
10. Expanded notions of 'innovation', as an investment effort in which knowledge, funding and other social and cultural resources are deployed over time to create value, are required to lead to inclusive development.

Researching universities in innovation for inclusive development

In this concluding section, we return to consider how the South African studies inform future directions for the broad UNIID research agenda.

The empirical case studies have focused primarily on the university actors, to inform strategic policy in relation to the role of universities in the national system of innovation. Thus, future research would benefit from a primary focus on community actors, taking their livelihood needs and the strategies to address them as the primary entry point for empirical study. Who do marginalised communities turn to first? Why and how do they turn to universities? What are the organisational forms that support their interaction with academics? We need more in-depth evidence of the actors, drivers and dynamics of the survivalist enterprises characteristic of these informal settings, whether farmers, co-operatives, individuals or micro-enterprises.

Our working concept of 'benefits' needs further empirical and conceptual elaboration and refinement. Our analysis in Chapter Eight reflected the complex permutations possible, using our criteria. An interaction could be replicable and add environmental value, but not add a great deal of social value. Or it could add social and environmental value, but not be replicable. Given our focus on the university actors, and the small number of cases, we did not have sufficient evidence to measure the social value added, or the sustainability and replicability in any active way. This made it difficult to compare the 'success' or impact of the interaction in each case. Nevertheless, the analysis suggests that pursuing such an approach through further work would go some way towards developing useful measures and indicators of the outcomes and impact of innovation and interaction with marginalised communities.

We can also identify critical issues for universities that can be addressed by a more systematic, in-depth analysis of our data. For example:

1. A systematic comparison across cases of the interactive capabilities of South African universities: what are the policies, structures and mechanisms that can be extended or replicated, if we are to promote innovation by and for marginalised communities?
2. A systematic comparison of the drivers of interaction for universities and marginalised communities.
3. An exploration of the main patterns and practices of interaction in different types of university.
4. A more in-depth focus on the enablers of specific forms of interaction and knowledge flows, for example how are bi-directional knowledge flows facilitated, or how is student learning facilitated?

Finally, universities' role as knowledge producers in the national system of innovation should be to promote technological capability building, and to inform inclusive economic strategies. Our cases resulted in direct livelihood benefits for a specific group, although they contributed to knowledge that could be replicated in other settings. They did not lead to change on a significant scale, and the real challenge of inclusive development is to move beyond small-scale interventions. Here networks are critical. We need more research on how universities can build networks with local development partners, who can use the insights of academic research to replicate interventions and move to scale.

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