
Theorising and strategising with models: generative models of social enterprises

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Abstract: Social entrepreneurship research often relies on presenting narratives of organisations that integrate various actors, actions, contextual elements and outcomes without a clear perspective on why these elements were selected and what can be learned from them. This paper provides a transparent and systematic process of modelling organisations and proposes a validity triangle that adequately integrates analytical, theoretical and ontological dimensions. An illustrative case study demonstrates the choices involved in a valid modelling process. It also illustrates the steps involved in building a generative model of a social enterprise that accounts for the mechanisms that explain how the focal organisation achieves multiple strategic objectives.

Keywords: social entrepreneurship; generative model; retrodution; social mechanisms.

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1 Introduction

“Every company has a business model,” affirms Chesbrough (2007, p.12), and Magretta (2002, p.87) states that “a good business model remains essential to every successful organization.” Various authors have positioned the concept of *business model* as key to understanding organisations. Recently, scholars have also applied the concept to the study of social enterprises. They propose that new business models can alleviate poverty and at the same time generate real economic returns (Chesbrough et al., 2006; Hart, 2007; Prahalad, 2005). To answer the question of how to reach and serve poor people successfully, Hart (2007, p.142) claims: “It’s the Business Model, Stupid.” At the same time, scholars have voiced concerns that the rapid proliferation of the concept has created an abundance of meanings (Ghaziani and Ventresca, 2001; Hedman and Kalling, 2003;

Shafer et al.; Schweizer, 2005). That, according to Porter (2001, p.77), constitutes “an invitation for faulty thinking and self-delusion.” Chesbrough and Rosenbloom (2002, p.553) point out that the concept “draws from and integrates a variety of academic and functional disciplines, gaining prominence in none.” Zott et al. (2011), reviewing the business model literature, find that researchers frequently adopt idiosyncratic definitions they deem convenient and this hampers cumulative progress. Research into new business models in the context of poverty often reduces complex phenomena to narrative accounts of unusual activities, actors, stories, motivations, intentions, decisions and other elements that are insufficiently grounded in theory (Jaiswal, 2008; Karnani, 2007; Seelos and Mair, 2007; Walsh et al., 2005). The absence of a clear theoretical perspective prompted Walsh et al. (2005) to label Prahalad’s (2005) book ‘motivational.’ The authors argued that this literature leaves it unclear how business models actually create value in the sense of eliminating poverty and what the overall contribution of these models is.

The conceptual ambiguity of the term *business model* appears to stifle progress by failing to provide truthful and therefore practical explanations. Enabling social and economic progress thus challenges us to find better approaches to systematic learning about social entrepreneurs and their organisations (Short et al., 2009). DiMaggio (2001) highlights the requirement of moving from discourses and rich stories in the social sector to causal models if we are to assess the effectiveness of organisations and inform practice and public policy decisions. Therefore, the central purpose of this paper is to develop a transparent and systematic modelling process that enables a theoretically valid and practically useful understanding of social enterprises. The proposed modelling process takes the *model* in *business models* seriously. It is grounded in model theory – i.e., the use of models in science (Frigg and Hartmann, 2009; Giere, 1999; Godfrey-Smith, 2006; Machamer et al., 2000) – and the call of scholars for a more model-centric social science (Baden-Fuller and Morgan, 2010; McKelvey, 2000). Furthermore, the modelling process developed here engages the recent plea for more mechanism-based explanations in the social sciences (Demetriou, 2009; Gerring, 2007; Hedström and Swedberg, 1998; Mahoney, 2001). In line with a proposed realist turn in management science (Reed, 2005), a commitment to realist mechanism-based explanations is adopted: “To explain a fact is to exhibit the mechanism(s) that makes the system in question tick” (Bunge, 2004, p.182). Realism employs *generative models* – i.e., models that explain how social mechanisms contingently create observable outcomes (Bunge, 2004; Demetriou, 2009; Pawson, 1989). The main contribution of this paper is to combine these literatures as a basis for proposing a systematic and transparent process of building a generative model as a tool for theorising (truthfulness) and strategising (usefulness). This process is grounded in the notion of a *validity triangle* – i.e., a reflection on adequate analytical, theoretical and ontological modelling choices.

The paper proceeds as follows: it first reflects on the role of models in science and the benefits of model building in support of social science practice. Then, a clear specification of the requirements that define useful and valid models is developed. This generic model template is then applied to an illustrative case study to demonstrate the process of *how* to build a generative model of a social enterprise – i.e., an account of the mechanisms that generate organisational outcomes of interest to the investigator. Finally, reasons *why* this modelling process is useful from theoretical and practical perspectives are discussed.

2 The role of models in science

Suppe (2000, p.S109), reflecting on 30 years of theory development, concludes: “Today, models are the main vehicle of scientific knowledge.” Philosophers of science have highlighted the limits that the complexity of phenomena poses for objectively exploring how the world works. Models were advanced as important means to overcome this limitation (Frigg and Hartmann, 2009). Giere (1999, 2006) sees models as central tools in the sciences for explicitly representing selected aspects of the world for various purposes of scientific investigation. Furthermore, both in the natural (Downes, 1992; Godfrey-Smith, 2006) and in the social sciences (Bourgeois, 1979; Merton, 1968; Morgan and Morrison, 1999), scholars have proposed a shift from *theories* to the actual process of *theorizing*. Model building plays a central role as an analytical tool for theorising as scientific practice (Morgan and Morrison, 1999). Hartmann (2008, p.98), reflecting on the practical advantages of models over theories, states: “They are also more intuitive, visualisable and ideally capture the essence of phenomena in a few assumptions.”

3 Specifying models in the social sciences

Several authors point out the important role of models in the social sciences linking theory and the observable world (Brante, 2010; Franck, 2002; Giere 1999; McKelvey, 2000). McKelvey (2000, p.773) goes so far as to state that “in order for organization ‘science’ to avoid or recover from scientific discredit and institutional illegitimacy, it must become model-centered.” Because models selectively represent theoretical and empirical elements, researchers must explicitly specify the relationships of model/theory and model/ontology. The perspectives articulated by Azevedo (1997), Morgan and Morrison (1999), and McKelvey (2002) are integrated into a validity triangle that postulates that model validity requires analytical, theoretical, and ontological adequacy.

3.1 Analytical adequacy

Models are idealisations, and therefore no single correct model can exist. Rather, models are more or less useful given the particular interest of the researcher (Azevedo 1997). In the words of Mäki (2010, p.179): “Models are created by modellers to serve their interests in certain situations. The modellers’ goals and contexts provide the pragmatic constraints on modeling.” This has implications for what theories and empirical content get integrated into the model. Being explicit and systematic about the set of model choices is thus a crucial feature of rigorous and transparent modelling. Analytical adequacy means that the model adequately describes and explains social phenomena given the particular interest of the investigator.

3.2 Theoretical adequacy – the model/theory relationship

Theoretical adequacy specifies which theoretical elements are formalised into the model. Theory as used here explains not real-world behaviour but model behaviour and serves as a toolbox for the construction of models (Suarez and Cartwright, 2008).

It specifies the constitutive elements and the particular form of the model to achieve what Azevedo (1997) calls ‘focused simplification.’ The type of theory engaged also has implications for the set of empirical data that go into the model. Theoretical adequacy is the ability of selected theories to specify model structure, content and behaviour that strengthen the explanatory power of a model according to the researcher’s interest.

3.3 Ontological adequacy – the model/ontology relationship

Ontological adequacy reflects how well the selected parts of the model resemble specific counterparts in the real world (McKelvey, 2000). A transparent and systematic model/ontology relationship enables a researcher to investigate the model in place of its target “without sacrificing the quest for knowledge about real systems.” [Mäki, (2010), p.179]. This contributes to the validity of models as independent tools for theorising (Morgan and Morrison, 1999). Another important consideration is the particular ontological commitment of the researcher. Whether a researcher operates from a commitment to objectivist or subjectivist ontologies is likely to influence modelling choices (Johnson and Duberley, 2000). This study is committed to a realist philosophy of science based on mechanism-based explanations as outlined in the illustrative case study in the next section.

Because of the many choices involved in model building, transparency and a systematic account of the modelling process are key. The links and interdependencies of analytical, theoretical and ontological perspectives generate an iterative process of model building guided by a continuous evaluation of all aspects of the validity triangle.

4 Generative models for realist mechanism-based explanations

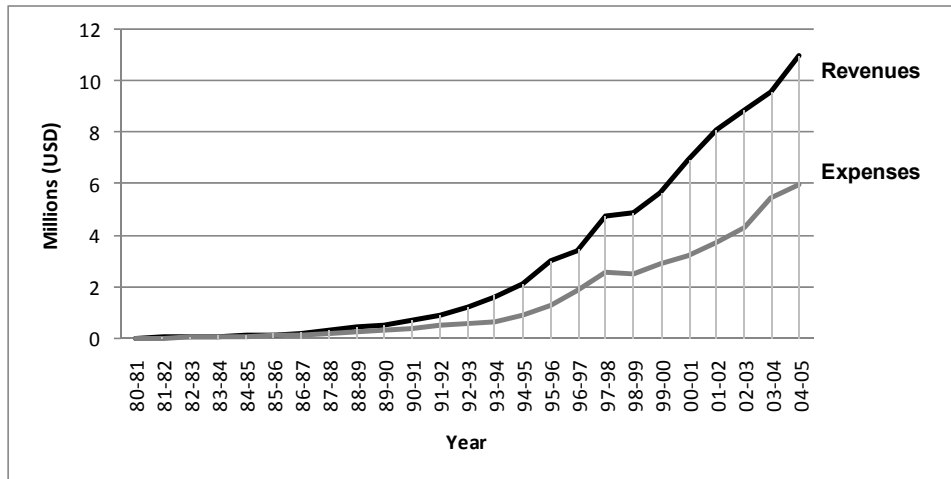
To illustrate this set of analytical, theoretical and ontological choices, a model of the social enterprise Aravind is constructed.

4.1 Focal organisation: Aravind¹

Aravind in India is the largest group of eye hospitals in the world. Their mission is to eradicate unnecessary blindness, and they have pioneered a novel approach to delivering eye surgery for cataracts that integrates free surgery for the poor as a major strategic objective. Cataracts affect millions of people, and access to appropriate eye care could make up to 80% of blindness preventable or curable (World Health Organization, 1997, 1999).

In 1976, Dr. Govindappa Venkataswamy, a retired ophthalmologist, founded Aravind in the city of Madurai. Aravind currently performs over 300,000 eye surgeries annually and provides eye care services to more than 2 million outpatients. While more than half of their high-quality eye surgeries are provided to the poorest for free, Aravind manages to generate significant profits that are used to invest in capacity building and increasing the scale of Aravind’s activities (see Figure 1).²

Figure 1 Revenues and expenses of Aravind between 1980 and 2005; insert: percentage of free versus paying patients treated in 2005



In 1992, David Green, a US-based entrepreneur, started the manufacturing company Aurolab in order to remove an important bottleneck in Aravind's model – the limited availability of high-quality lenses required for surgeries. When Aurolab started, the industry did not consider India a significant market. Green built Aurolab as a state-of-the-art production facility next door to Aravind. The low-cost and high-quality lenses provided by Aurolab were a crucial element in enabling the significant expansion of Aravind.

4.2 Preparing a model template for Aravind

4.2.1 Analytical perspective: objectives and research question

A primary research interest was to understand Aravind's potential to achieve its ambitious growth objective: i.e., the ability to treat increasingly higher numbers of patients. Aravind operates in the context of deep poverty in rural India. Acquiring the necessary resources to operate an efficient health service model is a key constraint. An illustrative research question that demonstrates choices about selecting theoretical and empirical parts for modelling Aravind is thus: *What is the role of resources in explaining how Aravind achieves its strategic objectives, and how does the current configuration of resources enable or challenge growth?* This question is relevant given the focal analytical interest because evaluating Aravind's growth potential requires an understanding of how Aravind works – i.e., how it achieves its objectives (the main explanandum in this illustrative case). This will enable a better understanding of its potential and limits for acquiring and productively integrating additional resources necessary for growth. Thus, the resource-based view (RBV) of the firm was chosen as an adequate theoretical perspective for model construction that is expected to illuminate the main analytical interest underlying this paper. This merely illustrates a modelling choice given a particular analytical interest or research question. Other theoretical perspectives may give rise to different models for different analytical interests or enable different perspectives on similar interests (Seelos and Mair, 2011).

4.2.2 Theoretical perspective: RBV

The RBV is an important perspective in the field of strategy (Barney et al., 2001; Locket et al., 2008). Sirmon et al. (2007) proposed a theoretical framework of the internal resource management of organisations in an attempt to shine some light on the ‘black box’ of how resources are configured to create value. The authors proposed three distinct dimensions: structuring, bundling and leveraging resources. These dimensions are adopted as the theoretical framework for a model of Aravind. Structuring, bundling and leveraging resources thus inform the content and behaviour of the model.

The first dimension of this RBV framework is structuring the resource portfolio. The resources that enable operating an eye hospital are easy to observe and do not pose much analytical ambiguity. However, accessing these resources is a challenge in environments of low munificence – a defining characteristic of the context of deep poverty. Resource exchanges are inefficient, and economic valuation is difficult. Structuring the resource portfolio may require partnering with various organisations to access specific types of resources or internal development and accumulation of resources.

A second RBV dimension is bundling of resources to create value. The various bundling processes outlined by Sirmon et al. (2007) are simplified into the construct of *resource configuration*. This refers to integrated sets of resources that generate the essential organisational activities as part of the value-creation logic of an organisation.

The third RBV dimension proposed by Sirmon et al. (2007), leveraging resource bundles to achieve competitive advantage, also needed adaptation. The context of deep poverty is not easily comparable to a competitive market, where relative performance is traditionally measured in comparative financial metrics. Social enterprises have both economic and non-economic objectives. The dimension of *leveraging resources* is adapted by specifying the consequences of deploying resource bundles to explain how they achieve the core financial and non-financial strategic objectives of Aravind.

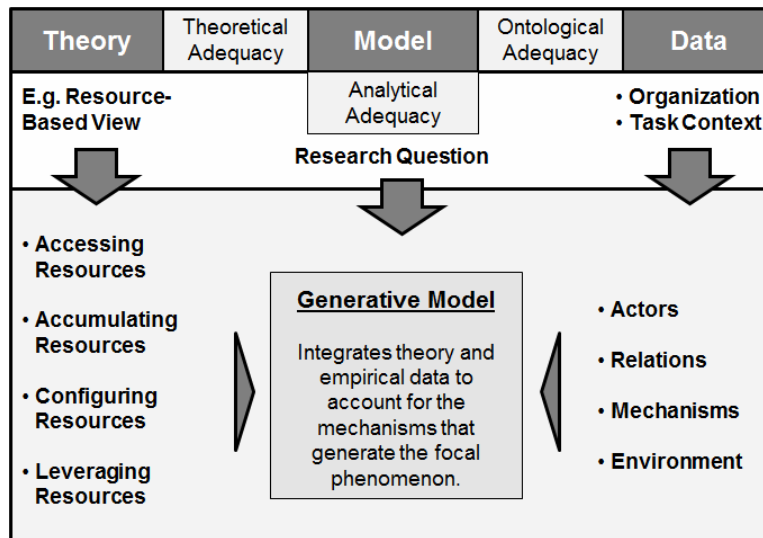
4.2 Ontological perspective: Aravind and its task environment

This paper explicitly embraces an ontological commitment grounded in scientific realism. From this perspective, explaining a social phenomenon is to exhibit or assume the sets of mechanisms that make a social system work the way it does (Bunge, 2004; Sayer, 1992). Bunge (2006) defines the minimum required set of specifications to model a concrete social system such as an organisation as *constituents, structure, mechanisms* and *environments*. To map this on to the RBV template, *constituents* are integrated in the form of social actors as the principal resources in the analysis. Other resources are integrated to the extent that they enable or constrain achievement of organisational objectives. *Structure*, following Tsoukas (1989), refers to the set of relations between resources that have both enabling and constraining effects on the generation of mechanisms and outcomes. *Mechanisms* refer to the set of activities and processes that generate the consequences of interest in the focal phenomenon. *Environment* is specified as those constituents, structures and mechanisms in the task environment of an organisation that influence what the organisation can achieve.

This modelling specification is deemed relevant given the research objective. As Pickel (2007, p.402) states: “Any model leaving out one or more of these elements is likely to lead to misinterpretations of what is actually going on that may subsequently give rise to faulty social technologies (e.g., ill-conceived economic policies, management

fads, counterproductive labour-saving initiatives, or costly mergers).” It is proposed that the illustrative generative model developed here is theoretically informed by the RBV and ontologically constituted by the constellations of actors, relationships and mechanisms that comprise the target organisation and its task environment. The model explains how this constellation generates empirical outcomes of interest and is thus analytically valid. Figure 2 summarises the elements of the model template.

Figure 2 Illustrative structure of a generative model of Aravind



4.3 Working with the model template

A realist explanation of organisational phenomena proceeds along a retroductive logic, where outcomes are explained as the consequences generated by social mechanisms (Sayer, 1992). Tsoukas (1989, p.558) states it like this: “During the process of explanation, the first stage involves (a) resolving the actions themselves into their constitutive components and (b) theoretically redescribing these components so that their inner constitution is revealed (Bhaskar, 1978).” This is the approach followed in building the model. In a first step, the RBV template allowed mapping the relevant constitutive actors, structures and mechanisms, and then in a second step, the final generative model was developed. It is constituted by the relationships between resources and the main mechanisms that generate empirical outcomes of interest. Yin (2003) recommended following prior theoretical propositions as one analytical strategy for analysing case study evidence. In the same way that propositions help to “focus attention on certain data and ignore other data” [Yin, (2003), p.112], the model template focuses attention to those aspects of reality that are likely to have explanatory power. The approach used in this paper is also consistent with Yin’s (2003) explanation building as a special type of pattern matching. This approach rests on a gradual development of plausible explanations in an iterative process. The modelling approach here follows a similar logic where the explanatory power of the model emerges in an iterative process that is described below in the section “Building the generative model.”

Figure 3 Core elements of Aravind selected for potential integration into the generative model, (a) accessing and accumulating resources, (b) – configuring and leveraging resources to achieve strategic objectives

Accessing Resources
<ul style="list-style-type: none"> • Aravind family members as eye doctors and senior management provide leadership, medical services, expertise and maintain a strong sense of vision, focus and organizational culture; they ensure consistent selection of hires that fit culture and mission. • Local and international eye doctors are attracted by Aravind as a premiere training institution with large numbers of „interesting“ cases due to the high volumes and the strong sense of mission. • NGOs and foundations (e.g. Seva, Rotary, Lions Clubs) provide funds for new projects, expertise and know how because of Aravind’s mission to prioritize health services for the poor. • The caring mission of Aravind overcomes hesitation by families to let their daughters leave home and become nurses. • Partnerships with leading international ophthalmology research centers facilitates knowledge sharing and access to best practices. • Community partners in rural villages provide publicity, marketing and demand generation using local funds and services and their legitimacy and relationships. • Aurolab partners with IOL International, a US lens manufacturer to transfer key technology to India.
Accumulating Resources
<ul style="list-style-type: none"> • Active nurturing by Aravind’s leadership team of the strong sense of mission and purpose, values and dedication by all staff builds a strong culture of excellence and service. • Nurses are recruited and trained as young girls from villages with little alternative opportunities; they are willing to work hard and identify with Aravind values and become outstanding paramedics. • Exchange programs with top institutes prevent fears of de-skilling amongst Aravind doctors due to their repetitive tasks of high-volume cataract surgery; as a result, experienced highly productive doctors remain at Aravind rather than leaving for jobs with higher task variety. • Aravind runs a dedicated institute for general management skill development and training of eye doctors and nurses – improves pool of existing staff and builds additional eye doctors and nurses as a basis for capacity expansion. • Internal research and division pushes for innovation and improvement in all areas of Aravind’s value chain. • Internal consulting division implements constant process improvements, monitors quality, benchmarks and diffuses best practices. • Aravind training institute requires constant reflection on metrics, best practices and problem solving mechanisms – nurtures a performance culture and ensures fast diffusion of innovations and improvements across units and hospitals • Aurolab was established to control the provision of high volumes of quality eye lenses at extremely low price points. • Steep learning curves through focused job designs (doctors do only essential parts of the surgical procedures) and high volumes. • Designs for "appropriate facilities" – only bare functionality to maintain patient dignity and surgical quality for free surgeries and more comfortable facilities for paying patients; facilitates self-selection because paying patients value the additional comfort. • Many programs with NGOs, foundations and R&D centers build partnership competencies and flexible use of scarce resources such as doctors and hospital space.

(a)

Configuring Resources
<ul style="list-style-type: none"> • Aravind family constantly engages with doctors and nurses to prevent mission drift and non-productive activities; constitutes a mechanism to solve problems fast and ensure consistent decision making processes. • Nurses, doctors and infrastructure are organized into a formalized workflow for optimized efficiency of surgeries, patient-care and administrative tasks – constant displays of metrics ensure evidence-based decisions and identification of improvement areas. • Community resources are integrated with hospitals to decentralize services into rural areas; eye camps enable rapid screening and only groups of selected patients are brought by busses to hospitals; manage pace of community involvement to fit capacity. • Busloads of patients from villages arrive at Aravind → stretches capacity and requires constant optimization of workflows across all hospital areas otherwise the business model would break down in short time (mistakes, stress, frustration, unhappy patients etc.) • IT-enabled vision centers link Aravind doctors as bottleneck resources with rural needs to maximize use of doctor’s time. • Aurolab employs target costing to manufacture affordable, high quality lenses and expands to international markets and leverages competencies to grow into other product categories. • Aurolab and Aravind are operated as separate organizations at arms-length with distinct cultures, structures and processes to force Aurolab to remain competitive and contribute to profit margins.

Leveraging Resources	Strategic Objectives
<ul style="list-style-type: none"> • Outstanding reputation for high quality surgeries • Reputation as an extremely caring organization • Very high productivity levels (e.g. surgeries per doctor) • Low cost operation • Large volume of patients can be treated • High-performance culture dedicated to their patients • Continuity and resilience of its business model • Capacity for expansion • Long-term strategic relationships and global ambassadors • Competitive organization despite lack of competition 	<ul style="list-style-type: none"> • Large Scale (treat as many people as possible) • High-Quality Surgeries (don't let poverty compromise service quality) • 60/40 Ratio of Free to Paid Surgeries (don't deny the poor access to treatment) • Profits (generate earned income to remain independent and enable further expansion)

(b)

Data collected during two independent field trips to Aravind and a number of interviews with Aravind personnel and stakeholders were independently coded by two researchers using the RBV template. The author of this paper participated in one of the field trips and

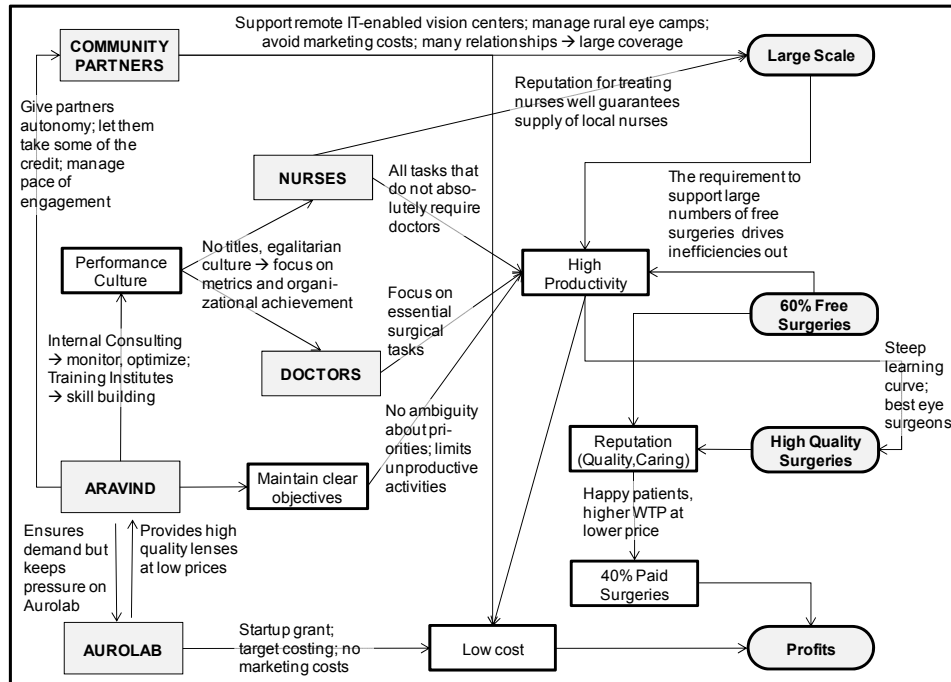
was one of the researchers involved in the coding process. Figures 3(a) and 3(b) list the elements that were identified that describe how resources are accessed, accumulated and configured and finally leveraged to achieve the four core strategic objectives of Aravind. The elements of Figures 3(a) and 3(b) constitute the potential content of a generative model as a first step in building the model.

4.4 Building the generative model

Generative models are constituted by the set of mechanisms that generate outcomes of analytical interest (Demetriou, 2009; Sayer, 1992). The starting point for this second step in the modelling process is the set of Aravind's core strategic objectives as provided in Figure 3(b). The objectives constitute the main explananda in this study – i.e., the main outcomes of interest to the investigator. This way, modelling remains grounded in a set of observable outcomes for which good empirical evidence over time was available. Following a retroductive logic, work proceeds backward by integrating the results of the analysis of resources in Figures 3(a) and 3(b). The goal is to provide explanations of how individual strategic objectives are achieved and to reflect on the consequences this might have for other objectives. This modelling process creates novelty beyond the theoretical or empirical perspectives engaged. It requires thought trials and conjectures that link the elements of Figures 3(a) and 3(b) into a holistic model. This requires connecting the elements that are given in a more linear manner in the RBV template in Figure 3(a) and 3(b) into multiple cause/effect relationships, i.e., specifying how these elements generate or co-generate outcomes. In practice this works by formalising thought trials and conjectures by arrows that constitute causal explanations specifying mechanisms that generate specific outcomes. For example, the large numbers of surgeries provided and the focus of doctors on only the essential tasks of surgery constitute a constellation of mechanisms that generate intense task repetition and thus a steep learning curve for Aravind doctors. As a result, Aravind accumulates a pool of the best eye surgeons in India. This also creates a reputation for high-quality surgery. The additional scale provided by treating large numbers of poor patients thus contributes positively to overall quality, and it also generates for Aravind a reputation of being a caring organisation. This constellation then provides a plausible explanation of why patients who are not poor are willing to pay. This exemplifies a set of mechanisms that was formalised into the generative model in Figure 4.

Model building is iterative and guided by the specified analytical, theoretical and ontological perspectives. The challenge for the modeller is to come up with a set of plausible causal links between the substructures of the model and the strategic objectives of the modelled organisation. The concept of plausible causal links used here refers to the actual (as verified empirically), potential (as a possibility derived from theory or experience with similar phenomena) or plausible (as perceived as likely given the constellation of factors and empirical data) mechanisms that generate phenomena (Demetriou, 2009; Machamer et al., 2000). Weick (1989) also argues that plausibility is a substitute for validity, and by reflecting on whatever data are available to select and retain conjectures, the model develops and progresses through testing for empirical adequacy given available data. Figure 4 represents an illustrative outcome of this process: a generative model of Aravind that adequately satisfies the main research interests and adequately engages a theoretical basis and available data.

Figure 4 Illustrative generative model of Aravind that maps the configuration of important relationships of actors (shaded rectangular boxes) within Aravind and its task environment and mechanisms that plausibly explain how main strategic objectives (shaded oval boxes) are achieved



4.5 Elaborating the generative model

Demetriou (2009) highlights the need to support generative models by narratives that fill in the blanks, provide context and anecdotal evidence that makes the model richer, and strengthen its plausibility. Due to limited space, only a partial narrative is provided for illustrative purposes. Some mechanisms can be more directly substantiated from available data. For example, several Aravind managers have highlighted the important connection between the need to integrate high volumes of non-paying patients and radical elimination of inefficiencies as a crucial factor to success in this model. The objective of providing free surgery also helps to access community partners as a valuable ‘low cost’ resource. Free surgeries are made very cost-efficient because many patient-related activities are managed by community partners. Free surgeries are provided with very basic facilities, such as ten-people sleeping rooms with no air conditioning or private bathrooms. This feature solves the *moral hazard* problem by a process of social self-selection, creating an effective barrier to those who can afford to pay demanding free treatment: wealthier people in India do not want to sit in the same waiting rooms as the very poor and desire more comfortable or even air-conditioned rooms. Nevertheless, the quality of the surgery is the same for both paying and non-paying patients by rotating doctors and nurses between facilities.

Free surgeries build a powerful reputation for Aravind of being caring and fair. Anecdotal evidence from several interviews indicates that paying patients value these

attributes independent of quality attributes and consider Aravind superior to other hospitals. This explains their willingness to pay (WTP) for these services: they perceive Aravind as a better deal than other hospitals but are still only required to pay average market prices. This drives the volume of paying patients as evidenced by the growing revenues in Figure 2. Scale, along with a diversity of interesting patient cases, makes Aravind an attractive training centre that receives top doctors from all over the world at very low labour costs, and the number of applications for Aravind training centres continues to rise. Several visiting doctors interviewed at Aravind have verified the high quality and productivity of Aravind surgeries. Aravind reports that their doctors perform about 2,000 operations per year, compared to an average of about 250 operations at other Indian hospitals. All the cultural, learning and operational mechanisms that enable this high productivity as shown in Figure 4 are important factors that explain how Aravind is able to keep costs low. Being able to charge market prices combined with a low cost structure and high volumes plausibly explains the profits generated in Aravind's business model.

High-quality Aurolab lenses are exported to about 120 countries, mainly to serve the needs of NGOs and not-for-profit hospitals. Aurolab does not release financials, but management confirmed they had significant profit margins. In 2008, Aurolab completed new production facilities in Madurai, which enabled a six-fold capacity expansion. An unintended consequence of the profitability of the model is that several competing lens manufacturers have been enticed to the Indian market. Thus, Aurolab must improve manufacturing efficiency to meet competition. Aravind gains from competition by having more choices on the supply side and further downward pressures on lens costs.

5 Discussion

Using Aravind as an illustrative case study, a process of building generative models was developed that involved three steps. First, by peeling away elements that do not directly inform the research question, a core model specification was derived that provided the content of the model, the elements listed in Figures 3(a) and 3(b). Second, thought experiments generated ideas about plausible configurations of these elements into the final model. This provided new explanations and insights addressing the research objective used to illustrate modelling choices. Third, the plausibility of the model was strengthened by providing evidence for conjectured mechanisms and narratives that provided context and richness beyond the formal model. Morrison and Morgan (1999, p.12) summarise their experience with model-based theorising by stating that learning comes less from looking at the model and "more from building the model and from manipulating it." The approach presented here emphasises this crucial role of models as tools for mechanism-based theorising understood as explaining social phenomena by specifying the set of mechanisms that generate them.

The RBV served as the main theoretical lens for the illustrative model. This choice was adequate given the objective to explore the topic of growth in Aravind, and it kept the final model simple, integrating those aspects of reality that had explanatory power. Operationalising the RBV enabled explanation of different economic and non-economic dimensions of value creation by Aravind. Ray et al. (2004) emphasised the need to disaggregate the dependent variable of firm performance to isolate the effects of how resources and activities create different aspects of value. For Aravind this was modelled

from the start by specifying four concomitant strategic objectives that have financial (e.g., profits) and non-financial dimensions (e.g., free surgeries). This analytical strategy may be useful in general to model social enterprises that frequently create multiple dimensions of value.

The analytical validity of the model is determined by how useful it is to provide answers given the interest in understanding the potential of Aravind's ability to grow. Apart from illustrating the choices involved in modelling and how modelling facilitates deep learning about an organisation, the generative model developed here may also serve as a progressive knowledge container. Scholars can correct the model with new data or better explanations and can integrate new insights from Aravind's scaling efforts over time. This is expected to expand but also make the model more robust. For example, a partial replication of the Aravind model in Cairo, Egypt, added a free surgery hospital to an existing traditional paying hospital. But overall patient flow increased only slowly, highlighting a number of context-specific differences between India and Egypt. Men and women could not share the same facilities for cultural reasons, and this required expensive workarounds. The density of community-based NGOs was much lower in Egypt, and the hospital needed to find substitute forms of re-creating this important demand enabler. When the momentum of increasing numbers of free surgeries finally picked up, the for-profit hospital experienced significant increases in paying patients as well. The new momentum now challenges staff to deal with the inefficiencies of the current workflows and to create more value from the limited resources available.³ This example provides evidence for the proposition that the free surgery part is an essential substructure of the generative model. Inclusion of free surgery in the generative model better explains achievements of other strategic objectives, such as productivity, as the basis for profits and quality. This suggests that the model of Aravind is a useful tool for informing decisions about context-specific hurdles or enablers of scaling.

5.1 Implications for researchers

Several scholars have pointed out that science progresses along a self-correcting path through variation of conjectures and selective retention of principles that get formalised into models and theories (McKelvey, 2002; Radnitzky and Bartley, 1987; Weick, 1989). The conceptualisation of business models as generative models constitutes common ground that enables progress in several ways. First, it enables integration of new insights to improve the ontological adequacy of the model in relation to the focal organisation. This also opens up new avenues for researchers to integrate other theoretical perspectives to inform different research questions. Second, the concept of a generative model as proposed here creates a transparent language that enables comparative studies across organisations and settings to derive more general theoretical propositions. Applying consistent modelling approaches thus may enable the building of more general theory by comparing models across organisations (Tsoukas, 1989). Third, valid generative models can inform organisational decision makers to *experiment* around hypotheses derived from the generative model. The current expansion in scale and scope of the Aravind eye hospital constitutes a number of natural experiments that may enable isolation of new or unearthing of hidden mechanisms to expand the generative model. Finally, models enable a potentially collaborative approach between disconnected empirical researchers and those who seek theoretical synthesis. Franck sees this divorce as a "deep malaise in the

social sciences” (Franck, 2002). Models serve as platforms that enable communication and cooperative work between scientists with different commitments toward the target system (Godfrey-Smith, 2006). This gives rise to a model-based self-correcting evolutionary epistemology that facilitates stepwise progress toward better theories (Azevedo, 1979; McKelvey, 2002).

5.2 Implications for practitioners

The practical relevance of academic research and management education at business schools has been questioned for some time. Scholars point to a disturbing gap between theory and practice (Baldrige et al., 2004; Bennis and O’Toole, 2004; Van de Ven and Johnson, 2006). Generative models are useful as collaborative learning opportunities in research and education and for consulting with students and organisations from both the for-profit and not-for-profit sectors. The process of model building is a fruitful platform for individuals or groups to clarify assumptions and meanings of concepts and to make the links between theory and reality explicit. For many organisations, modelling is also a useful tool to communicate their business logic to internal and external stakeholders. This facilitates better internal coordination of activities and external evaluation of an organisation’s potential. For organisations in the not-for-profit sector, this might facilitate interaction with philanthropists to highlight the most productive uses of donations – for example, to identify and eliminate important bottlenecks to achieve scale.

One useful application is to think about new innovative business models in the context of poverty. Companies may be able to leverage important resources and competencies that social enterprises have created, often over long time periods (Seelos and Mair, 2007). Understanding how social enterprises tick is required in order to find points that enable companies to dock on to the business models of social enterprises. Aravind management revealed that discussions with a leading lens manufacturer in the early 1990s were not fruitful due to concerns that India was not a viable market. While Aurolab is a non-profit structure, it might be plausible that a for-profit lens-manufacturing company could have combined its capital and technical resources and manufacturing capabilities with Aravind’s brand and its capabilities in order to orchestrate large-scale and high-productivity eye surgery. Aravind might have accommodated the need of a corporate partner to capture some of the value created for its shareholders given the extent of overall social value created by this model. As David Green from Aurolab, Aravind’s lens-manufacturing company, said in a recent speech addressing MBA students: “I am waiting for companies to compete with me or put me out of business for the benefit of the poor.”

Finally, this work is an ongoing process of theorising the validity and usefulness of modelling in the social sciences. Hopefully, it will stimulate the interest of other scholars in the effort to develop this approach further as an important analytical tool for the social sciences in general and the study of social entrepreneurship in particular.

References

- Azevedo J. (1997) *Mapping Reality: An Evolutionary Realist Methodology for the Natural and Social Sciences*, University of New York Press, Albany.
- Baden-Fuller, C. and Morgan, M.S. (2010) ‘Business models as models’, *Long Range Planning (by invitation)*, Vol. 43, Nos. 2–3, pp.156–171.

- Baldrige, D.C., Floyd, S.W. and Markoczy, L. (2004) 'Are managers from mars and academicians from venus? Toward an understanding of the relationship between academic quality and practical relevance', *Strategic Management Journal*, Vol. 25, No. 11, pp.1063–1074.
- Barney, J., Wright, M. and Ketchen, Jr., D.J. (2001) 'The resource-based view of the firm: ten years after 1991', *Journal of Management*, Vol. 27, No. 6, pp.625–641.
- Bennis, W.G. and O'Toole, J. (2004) 'How business schools lost their way', *Harvard Business Review*, Vol. 83, No. 5, pp.96–104.
- Bhaskar, R. (1978) *A Realist Theory of Science*, Harvester Press, Hassocks, England.
- Bourgeois, III, L.J. (1979) 'Toward a method of middle-range theorizing', *Academy of Management Review*, Vol. 4, No. 3, pp.443–447.
- Brante, T. (2010) 'Review essay: perspectival realism, representational models, and the social sciences', *Philosophy of the Social Sciences*, Vol. 40, No. 1, pp.107–117.
- Brilliant, L. and Brilliant, G. (2007) 'Aravind: partner and social science innovator (innovations case discussion: Aravind eye care system)', *Innovations: Technology, Governance, Globalization*, Vol. 2, No. 4, pp.50–52.
- Bunge, M. (2004) 'How does it work?: the search for explanatory mechanisms', *Philosophy of the Social Sciences*, Vol. 34, No. 2, pp.182–210.
- Bunge, M. (2006) *Chasing Reality: Strife over Realism*, University of Toronto Press, Toronto.
- Chesbrough, H. (2007) 'Business model innovation: it's not just about technology anymore', *Strategy & Leadership*, Vol. 35, No. 6, pp.12–17.
- Chesbrough, H., Ahern, S., Finn, M. and Guerraz, S. (2006) 'Business models for technology in the developing world: the role of non-governmental organizations', *California Management Review*, Vol. 48, No. 3, pp.48–61.
- Chesbrough, H.W. and Rosenbloom, R.S. (2002) 'The role of the business model in capturing value from innovation: evidence from Xerox corporation's technology spin-off companies', *Industrial and Corporate Change*, Vol. 11, No. 3, pp.529–556.
- Demetriou, C. (2009) 'The realist approach to explanatory mechanisms in social science. More than a heuristic?', *Philosophy of the Social Sciences*, Vol. 39, No. 3, pp.440–462.
- DiMaggio, P. (2001) 'Measuring the impact of the nonprofit sector on society is probably impossible but possibly useful: a sociological perspective', in Flynn, P. and Hodgkinson, V.A. (Eds.): *Measuring the Impact of the Nonprofit Sector*, Kluwer Academic/Plenum Publishers, New York, NY.
- Downes, S. (1992) 'The importance of models in theorizing: a deflationary semantic view', in Hull, D., Forbes, M. and Okruhlik, K. (Eds.): *Proceedings of the Philosophy of Science Association*, Vol. 1, Philosophy of Science Association, East Lansing.
- Franck, R. (2002) 'General introduction', in Franck, R. (Ed.): *The Explanatory Power of Models. Bridging the Gap Between Empirical and Theoretical Research in The Social Sciences*, Kluwer, The Netherlands.
- Frigg, R. and Hartmann, S. (2009) 'Models in science', in Zalta, E.N. (Ed.): *Stanford Encyclopedia of Philosophy (Summer 2009 Edition)*, [online] <http://plato.stanford.edu/archives/sum2009/entries/models-science/> (accessed 13 April, 2012).
- Gerring, J. (2007) 'Review article: the mechanistic worldview: thinking inside the box', *British Journal of Political Science*, Vol. 38, No. 1, pp.161–179.
- Ghaziani, A. and Ventresca, M.J. (2005) 'Keywords and cultural change: frame analysis of business model public talk, 1975–2000', *Sociological Forum*, Vol. 20, No. 4, pp.523–559.
- Giere, R.N. (1999) *Science Without Laws*, University of Chicago Press, Chicago.
- Giere, R.N. (2006) *Scientific Perspectivism*, University of Chicago Press, Chicago.
- Godfrey-Smith, P. (2006) 'The strategy of model-based science', *Biology and Philosophy*, Vol. 21, No. 5, pp.725–740.

- Hart, S. (2007) *Capitalism at the Crossroads: The Unlimited Business Opportunities in Solving the World's Most Difficult Problems*, Wharton School Publishing, Upper Saddle River.
- Hartmann, S. (2008) 'Modeling in philosophy of science', in Frauchiger, M. and Essler, W.K. (Eds.): *Representation, Evidence, and Justification: Themes from Suppes*, Ontos, Frankfurt.
- Hedman, J. and Kalling, T. (2003) 'The business model concept: theoretical underpinnings and empirical illustrations', *European Journal of Information Systems*, Vol. 12, No. 1, pp.49–59.
- Hedström, P. and Swedberg, R. (Eds.) (1998) *Social Mechanisms: An Analytical Approach to Social Theory*, University Press, Cambridge.
- Jaiswal, A.K. (2008) 'The fortune at the bottom or the middle of the pyramid?', *Innovations: Technology, Governance, Globalization*, Vol. 3, No. 1, pp.85–100.
- Johnson, P. and Duberley, J. (2000) *Understanding Management Research: An Introduction to Epistemology*, Sage, London.
- Karnani, A. (2007) 'The mirage of marketing to the bottom of the pyramid: how the private sector can help alleviate poverty', *California Management Review*, Vol. 49, No. 4, pp.90–111.
- Lockett, A., O'Shea, R.P. and Wright, M. (2008) 'The development of the resource-based view: reflections from Birger Wernerfelt', *Organization Studies*, Vol. 29, Nos. 8–9, pp.1125–1141.
- Machamer, P., Darden, L. and Craver, C.F. (2000) 'Thinking about mechanisms', *Philosophy of Science*, Vol. 67, No. 1, pp.1–25.
- Magretta, J. (2002) 'Why business models matter', *Harvard Business Review*, Vol. 80, No. 5, pp.86–92.
- Mahoney, J. (2001) 'Review: beyond correlational analysis: recent innovations in theory and method', *Sociological Forum*, Vol. 16, No. 3, pp.575–593.
- Mäki, U. (2010) 'Models and truth. The functional decomposition approach', in Suarez, M., Dorato, M. and Redei, M. (Eds.): *EPSA Epistemology and Methodology of Science: Launch of the European Philosophy of Science Association*, Springer, New York.
- McKelvey, B. (2000) 'Toward a model-centered strategy of science: more experiments, less history', in Sanchez, R. and Heene, A. (Eds.): *Research in Competence-Based Management*, JAI Press, Stamford CT.
- McKelvey, B. (2002) 'Model-centered organization science epistemology', in Baum, J.A.C. (Ed.): *The Blackwell Companion to Organizations*, Blackwell, Oxford.
- Merton, R.K. (1968) *Social Theory and Social Structure*, enlarged ed., Free Press, New York.
- Morgan, M.S. and Morrison, M. (Eds.) (1999) *Models as Mediators: Perspectives on Natural and Social Science*, Cambridge University Press, Cambridge.
- Morrison, M. and Morgan, M.S. (1999) 'Models as mediating instruments', in Morgan, M.S. and Morrison, M. (Eds.): *Models as Mediators: Perspectives on Natural and Social Science*, Cambridge University Press, Cambridge.
- Pawson, R. (1989) *A Measure for Measures: A Manifesto for Empirical Sociology*, Routledge, London.
- Pickel, A. (2007) 'Rethinking systems theory: a programmatic introduction', *Philosophy of the Social Sciences*, Vol. 37, No. 4, pp.391–407.
- Porter, M.E. (2001) 'Strategy and the internet', *Harvard Business Review*, Vol. 79, No. 3, pp.62–78.
- Prahalad, C.K. (2005) *The Fortune at the Bottom of the Pyramid*, Wharton School Publishing, Upper Saddle River.
- Radnitzky, G. and Bartley III, W.W. (Eds.) (1987) *Evolutionary Epistemology, Rationality, and the Sociology of Knowledge*, Open Court Publishing Co, La Salle.
- Rangan, V.K. and Thulasiraj, R.D. (2007) 'Making sight affordable (innovations case narrative: the Aravind eye care system)', *Innovations: Technology, Governance, Globalization*, Vol. 2, No. 4, pp.35–49.

- Ray, G., Barney, J.B. and Muhanna, W. (2004) 'Capabilities, business processes, and competitive advantage, choosing the dependent variable in empirical tests of the resource-based view', *Strategic Management Journal*, Vol. 25, No. 1, pp.23–37.
- Reed, M. (2005) 'Reflections on the realist turn in organisation and management studies', *Journal of Management Studies*, Vol. 42, No. 8, pp.1621–1644.
- Sayer, A. (1992) *Methods in Social Science. A Realist Approach*, Routledge, New York.
- Schweizer, L. (2005) 'Concept and evolution of business models', *Journal of General Management*, Vol. 31, No. 2, pp.37–56.
- Seelos, C. and Mair, J. (2007) 'Profitable business models and market creation in the context of deep poverty: a strategic view', *Academy of Management Perspectives*, Vol. 21, No. 4, pp.49–63.
- Seelos, C. and Mair, J. (2011) 'Organizational mechanisms of inclusive growth: a critical realist perspective on scaling', Stanford PACS Working Paper, Stanford University, Stanford.
- Shafer, S.M., Smith, H.J. and Linder, J.C. (2005) 'The power of business models', *Business Horizons*, Vol. 48, No. 3, pp.199–207.
- Short, J.C., Moss, T.W. and Lumpkin, G.T. (2009) 'Research in social entrepreneurship: past contributions and future opportunities', *Strategic Entrepreneurship Journal*, Vol. 3, No. 2, pp.161–194.
- Sirmon, D., Hitt, M.A. and Ireland, R.D. (2007) 'Managing firm resources in dynamic environments to create value: looking inside the black box', *Academy of Management Review*, Vol. 32, No. 1, pp.273–292.
- Suarez, M. and Cartwright, N. (2008) 'Theories: tools vs. models', *Studies in the History and Philosophy of Modern Physics*, Vol. 39, No. 1, pp.62–81.
- Suppe, F. (2000) 'Understanding scientific theories: an assessment of developments, 1969–1998', *Philosophy of Science*, Vol. 67, Supplement, *Proceedings of the 1998 Biennial Meetings of the Philosophy of Science Association, Part II: Symposia Papers*, pp.S102–S115.
- Tabin, G. (2007) 'The cataract blindness challenge (innovations case discussion: Aravind eye care system)', *Innovations: Technology, Governance, Globalization*, Vol. 2, No. 4, pp.53–57.
- Tsoukas, H. (1989) 'The validity of idiographic research explanations', *Academy of Management Review*, Vol. 14, No. 4, pp.551–561.
- Van De Ven, A.H. and Johnson, P.E. (2006) 'Knowledge for theory and practice', *Academy of Management Review*, Vol. 31, No. 4, pp.802–821.
- Walsh, J.P., Kress, J.C. and Beyerchen, K.W. (2005) 'Book review essay: promises and perils at the bottom of the pyramid', *Administrative Science Quarterly*, Vol. 50, No. 3, pp.473–482.
- Weick, K.E. (1989) 'Theory construction as disciplined imagination', *Academy of Management Review*, Vol. 14, No. 4, pp.516–531.
- World Health Organization (1997) WHO Fact Sheet N230.
- World Health Organization (1999) WHO Fact Sheet N143.
- Yin, R.K. (2003) 'Case study research', *Design and Methods*, 3rd ed., Sage, London.
- Zott, C., Amit, R. and Massa, L. (2011) 'The business model: recent developments and future research', *Journal of Management*, Vol. 37, No. 4, pp.1019–1042.

Notes

- 1 Based on this research as well as publications by Brilliant and Brilliant (2007); Rangan and Thulasiraj (2007) and Tabin (2007).
- 2 Data provided by R.D. Thulasiraj, Executive Director of the Lions Aravind Institute of Community Ophthalmology.
- 3 Information is based on interviews with staff at the Cairo Al-Noor hospital by the author in 2007.