Frugal business model innovation in the Base of the Pyramid
The case of Philips Community Life Centres in Africa

Onsongo, Elsie K.; Knorringa, Peter; van Beers, Cees

DOI
10.1016/j.technovation.2022.102675

Publication date
2023

Document Version
Final published version

Published in
Technovation

Technovation 121 (2023) 102675

Contents lists available at ScienceDirect

Technovation

journal homepage: www.elsevier.com/locate/technovation

Frugal business model innovation in the Base of the Pyramid: The case of Philips Community Life Centres in Africa

Elsie K. Onsongo [a,*], Peter Knorringa [b], Cees van Beers [c]

[a] International Centre for Frugal Innovation - Kenya, Centenary House, Block B, Ring Road Westlands Lane, P. O. Box 2781 – 00606, Nairobi, Kenya
[b] International Centre for Frugal Innovation, International Institute of Social Studies, Erasmus University Rotterdam, Kortenaerkade 12, 2518 AX the Hague, the Netherlands
[c] Delft University of Technology, Faculty of Technology, Policy and Management, Jaffalaan 5, 2628 BX, Delft, the Netherlands

A B S T R A C T

This paper investigates how a multinational enterprise (MNE) engages in frugal business model innovation to find the optimal balance between value creation and value capture in resource-constrained contexts in sub-Saharan Africa. Using qualitative content analysis, we analyse the case of Community Life Centres (CLC), a primary healthcare innovation developed by Royal Philips N.V., a multinational technology organisation headquartered in The Netherlands. Our findings show that an MNE can innovate by developing multiple iterations of the same business model—customising it to different geographical markets. Some aspects of the business model remain static, while others are dynamic. In this regard, the innovation process in a resource-constrained service sector is pegged on the financing model, and target markets are adjusted based on financial opportunities available, while the value proposition and costing mechanisms remain relatively static. This paper contributes new insights to the frugal innovation and business model innovation literature.

1. Introduction

Business models are seen as a useful management tool that reflects an organisation's strategic orientation (Massa et al., 2017; Zott et al., 2011). Although the literature varies, a business model can be defined in terms of its value proposition, the activities the firm undertakes to create value for a specific market, and the mechanisms of capturing value (Saebi et al., 2017; Teece, 2010; Wirtz et al., 2016). Business models have also been found to be dynamic: they evolve when an organization aligns itself to its external environment through business model adaptation (Saebi et al., 2017). Further, new business models may be developed when the organisation is entering a new geographical market. Thus, a multinational enterprise (MNE) that is expanding its business into base of the pyramid environments must engage in business model innovation in order to develop context-appropriate solutions (Bohnsack et al., 2014).

Base of the pyramid (BOP) markets are associated with unique challenges and opportunities, in particular, severe resource constraints and institutional voids that call for innovative, locally-relevant solutions (Leliveld and Knorringa, 2018; Onsongo, 2017). Following the lead of Prahalad and Hammond (2002), who coined the term, BOP contexts have been defined based on per capita income at or below US$1500 or US$2000 *per annum*. The BOP market has also been described based on the household poverty threshold of US$1 or US$2 per day (Banerjee and Duflo, 2007). BOP markets were previously associated with entire countries and regions in Africa, Asia and Latin America (Kolk et al., 2014), or even more generally, emerging markets (Khanna et al., 2005). However, the discourse has evolved to focus on customer segments characterized by strong resource constraints and poor market access.

To serve these markets, MNEs must figure out how they can deliver products and services that are considerably cheaper, maintain functionality, and are affordable to low-income customers. Frugal innovation offers a paradigm for doing so. Frugal innovation has been defined as the (re)designing products, services, systems, and business models in order to reduce complexity and total lifecycle costs, and enhance functionality, while providing high user value and affordable solutions for relatively low-income customers (Leliveld and Knorringa, 2018). Frugal business models deliver low-cost high-quality products to BOP markets, and through frugal business model innovation, organisations search for the optimal balance between value creation and value capture (Ausrød et al., 2017; Howell et al., 2018; Winterhalter et al., 2017). This balance is more elusive when the corporation collaborates with diverse partners to create value (Lepak et al., 2007; Soumaya, 2014). While the frugal innovation literature acknowledges the importance of business models when deploying solutions in BOP markets, not much empirical attention has been paid to frugal business model *innovation*, i.e., how corporations

* Corresponding author.
E-mail addresses: eonsongo@cfia.network (E.K. Onsongo), knorringa@iss.nl (P. Knorringa), c.p.vanbeers@tudelft.nl (C. van Beers).

https://doi.org/10.1016/j.technovation.2022.102675
Received 23 April 2020; Received in revised form 15 September 2022; Accepted 28 November 2022
Available online 7 January 2023

develop new business models suitable for these markets, and how these models evolve through time. Further, studies in the frugal innovation literature, the BOP literature and the business model literature are often cross-sectional in nature (e.g. Winterhalter et al., 2017), and thus, they fail to capture the dynamic nature of business models. This gap leads us to the following research questions: What drives frugal business model innovation in low-resource settings? Which elements of the business model shift, and what are the implications of such shifts on value creation and value capture? Finally, how can a MNE frame value creation and capture when diverse actors are involved in deploying business models?

To address these questions, we investigate how an MNE engages in business model innovation through time to find the optimal balance between value creation and value capture in BOP markets. We focus on frugal innovation in public-sector primary healthcare service delivery in sub-Saharan Africa. Primary healthcare is a pertinent development issue as highlighted by Sustainable Development Goal (SDG) 3 which aims to "ensure healthy lives and promote well–being for all at all ages" (United Nations, 2015). Thus, understanding the implications of innovation on healthcare service delivery, particularly in resource constrained contexts, contributes to the discourse on how to improve healthcare outcomes in developing countries (Ramdorai and Herstatt, 2015; Sarkar and Mateus, 2022a). In this paper, we analyse a case study of Philips Community Life Centres (CLC), a primary healthcare innovation developed by the Dutch MNE Royal Philips N.V. Known for supplying medical equipment to large tertiary hospitals, Philips is currently expanding its business in sub-Saharan Africa into community-level healthcare service delivery. If successfully deployed, Philips CLCs are set to disrupt the public primary healthcare space in Africa by introducing new business models that have diverse partners in their value networks. Given that the CLC programme is still in an early stage of development, this case study provides an opportunity to analyse how an MNE experiments with different options to find the most sustainable business model or set of models. We adopt a longitudinal approach by analysing the evolution of Philips CLC business models from 2012 when the first version of the CLC was conceptualised to 2019 when eight CLCs have been deployed. We identify which elements of the business model drive the innovation process and why.

Our findings show that, in primary health care, business model innovation is driven by the financing model due to resource constraints at the base of the pyramid. We identify three foundational business models applied in this setting: public-private partnerships, donor financing, and commercial models. In practice, these models are layered or integrated depending on the context and the opportunities available. The models are associated with different configurations of value networks which bring about new dilemmas for the MNE on how to package the value proposition and how to capture value. Further, the findings show that target markets in the business models analysed are adjusted based on financing opportunities available.

The rest of the paper organised into four sections. Section 2 briefly presents the debates in the literature regarding value creation and capture, and how it relates to frugal innovation and business models in a resource constrained setting. Section 3 outlines the research methodology, and section 4 presents the findings from the case analysis. The discussion and conclusion are in section 5.

2. Literature review

We draw our literature review from two main research streams: business model innovation, where we focus on changes in business models and value; and frugal innovation, with a focus on frugal business models.

2.1. Business model innovation

Although there are many conceptualisations of business models in extant literature, they are generally seen as the way enterprises create and capture value in a given market (Chesbrough, 2010; Howell et al., 2018; Teece, 2010). Several topologies of business models have been developed in the literature (e.g. Osterwalder and Pigneur, 2010; Pateli and Giaglis, 2005; Zott et al., 2011), spanning three to nine dimensions (Rosca et al., 2016). Saebi et al. (2017, p. 568) argue that, despite this seeming variety, the literature converges on business model components that highlight (1) the firm's value proposition, (2) the activities the firm undertakes to realize the value proposition, i.e. targeting specific markets and mobilising certain value networks, (3) the mechanisms of value capture that the firm deploys, i.e. the revenue and costing mechanisms. We adopt this abridged perspective of the business model.

Business models are not static. They evolve due to shifting dynamics external or internal to the organisation (Saebi et al., 2017). In general, enterprises create value by building business models that exploit both social and commercial opportunities. Through business models, enterprises make strategic choices regarding their target consumer, the value proposition that would appeal to that consumer, and the structure of the value chain (Chesbrough and Rosenbloom, 2002; Teece, 2010; Zott and Amit, 2010). Thus, an enterprise's business model embodies its core logic to deliver value to its context and to itself (Massa et al., 2017; Shafer et al., 2005). It is used to articulate key assumptions about cause-and-effect and the consistency between the enterprise's strategic choices and all its structural elements (Cao et al., 2017; Kindström, 2010). Therefore, it follows that, to evaluate an enterprise's value creation efforts, the business model is a "theoretically anchored robust construct for strategic analysis" (Zott and Amit, 2013, p. 403). Further, a business model perspective focuses on value creation on both the demand side and the supply side (Massa et al., 2017).

An enterprise may change its offering in response to anticipated or actual changes in its operating environment, whether perceived as threats or opportunities (Afuah, 2004; Saebi et al., 2017). This process is referred to as business model adaptation. The enterprise may also change its business model to shape or create new markets or industries by creating disrupting innovations (Saebi et al., 2017), in a process referred to as business model innovation. Both processes emphasise experimentation, trial and error, reinvention, and learning (Andries and Debackere, 2013; Chesbrough, 2010; Foss and Saebi, 2017; Sosna et al., 2010; Teece, 2010). Changes manifest as an adaptation or a complete redesign of one or more of the business model elements. Further, a change in one element of the business model may demand a corresponding change or realignment of the other elements.

Given the dynamic nature of business models, any attempt to explore how an enterprise creates or captures value through its business model should involve a historical/longitudinal analysis. However, capturing the dynamic nature of business models is empirically difficult (Sinkovics et al., 2014). Empirical studies so far explore this proposition through cross-sectional single or multiple case studies (e.g. Sinkovics et al., 2014; Winterhalter et al., 2017), or only focus on a given business model element rather than the interaction among between elements (Demil and Lecocq, 2010). This study adopts a longitudinal approach to study business model innovation in healthcare to determine what are the drivers of the innovation process. But first, we explore the following concepts pertinent to our study: value—and the related concepts of value creation and capture, frugal innovation, and frugal business models.

2.2. Value

In the literature on strategy, value is often synonymous with exchange value or the price the customer is willing to pay, or the benefit the consumer experiences (Priem, 2007). Value has been defined as "the worth in monetary terms of the technical, economic, service, and social benefits a customer receives in exchange for the price it pays for a market offering" (Anderson, Narus, and Van Rossum, 2006, p. 24). However, the understanding of value has been extended beyond its

financially oriented transactional nature to other dimensions such as social and ecological, and to other stakeholders beyond just customers.

Value creation relates to how a firm creates value and delivers that value to the customer, and that value can be social in nature if it serves the needs of a given group, or has a positive effect on social wellbeing (Kroeger and Weber, 2014; Oskam et al., 2021). Value capture, on the other hand, refers to the firm's revenue model, i.e. how the firm appropriates some of the total value created, often expressed as the price accepted by customers (Amit and Zott, 2001; Pitelis, 2009), and has been associated with commercial or economic value expressed through profits and shareholder wealth (Vega and Kidwell, 2007). It is worth noting however that commercial value capture might also improve welfare by creating jobs, for example (Austin et al., 2006) and social value creation might also improve an economic situation, for instance by generating earned income. Studies have shown that value creation and value capture occur simultaneously (Lepak et al., 2007; Oskam et al., 2021).

The value creation and value capture dyad has traditionally been associated with traditional value chains and transactional networks where it is viewed as a linear economic process focused on cost, efficiency, and customer expectations (Pitelis, 2009). However, multi-actor and multi-level perspectives on value call for a shift that recognises the new service- and knowledge-based economy (Lepak et al., 2007; Oskam et al., 2021; Soumaya, 2014). Value creation and capture in an ecosystem is a more networked, open, and emergent process involving multiple actors, including customers and competitors, and is more knowledge-based, social, and intangible. However, tensions between value creation and capture arise from divergent interests and goals of the actors involved (Oskam et al., 2018; Ritala et al., 2013).

As such, how an organisation creates and captures value is dependent on how it interacts with the other actors involved (Bankvall et al., 2017). An organization can capture more, the same or less value than the one it co-creates. Further, potential value creation by one agent can be realized as value captured by another agent who, for example, is in a better position to capture such value through appropriate strategy (Breuer and Lüdeke-Freund, 2017; Lepak et al., 2007; Ritala et al., 2013). This calls for an appreciation of the strategies that organisations use to co-create and/or capture value and the potential trade-offs (Pitelis, 2009). Such strategies are evident in the business models that the firm deploys to extract value from its innovative endeavours (Chesbrough and Rosenbloom, 2002; Howell et al., 2018). Particularly, as business models are strategically redesigned, cost structures may change, incentives are aligned differently, and risks are distributed differently across the actors involved (Bankvall et al., 2017). In this paper, we explore value creation and capture in business models deployed in BOP environments.

2.3. Frugal innovation and frugal business models

Frugal innovation as a concept has recently gained increased attention from scholars and practitioners alike. This is because resource scarcity is now a feature of not only BOP markets—where the frugal innovation discourse initially focused on—but also wealthier industrialised markets (Cunha et al., 2014; Kroll and Gabriel, 2020; Sarkar and Mateus, 2022b). Thus, organisations must figure out how to effectively serve their markets with affordable products and services while minimizing waste in the whole value chain.

There are various definitions of frugal innovation in the literature, each highlighting different elements such as the philosophy, the product, the underlying innovation process, the outcome, the target market or region, and other criteria. The consensus is forming around the following defining aspects: frugality as a philosophy, mindset or paradigm for both producers and consumers (Onsongo and Knorringa 2020; Brem and Wolfram 2014; Soni and Krishnan 2014), high quality and easy-to-use products and services developed with minimal resources (Hossain, 2017; Ramdorai and Herstatt, 2015; Sehgal et al., 2010), and the disruptive nature of frugal products in new markets (Rao, 2013; Zeschky et al., 2014). Where the target market is the BOP, frugal products and services should be affordable and accessible (Leliveld and Knorringa, 2018; Liu and Wei, 2018).

In a BOP context, frugal business models aim to create value by delivering products and services to low-income customers in the most effective, convenient and affordable (Rosca et al., 2016; Sarkar and Mateus, 2022b; Winterhalter et al., 2017). This is especially germane to Western MNEs entering or operating in BOP markets as they have to change their philosophy and way of doing business to fit with the idiosyncrasies of the BOP. In simple terms, an MNE is an enterprise that adds value by producing in more than one national economy, and thus it owns outputs of goods and services originating in more than one country (Buckley, 1989). Scholars assert that business models deployed by Western MNEs in emerging markets differ from business models in industrialised contexts (Corsini et al., 2021; George et al., 2012; Halme et al., 2012; Winterhalter et al., 2017). For instance, the value proposition of frugal business models must consider not only cost reductions that are transferred to consumers through lower per-unit-prices, but also offerings that increase the customers' willingness to pay for them (Winterhalter et al., 2017). The value proposition must prioritize affordability, low total cost of ownership, robustness, ease of use, improved health and standard of living, and jobs creation, among other issues (Hossain, 2021; Tiwari et al., 2014). The revenue model must consider the high cost of operation in BOP markets and alternative customer financing mechanisms to enable them to pay (Prahalad and Hammond, 2002), and the value network often must incorporate local non-conventional partners (Ramdorai and Herstatt, 2015). Thus, enterprises must simultaneously cope with these operational pressures, while also considering societal problems such as inequality or environmental degradation with market solutions while balancing conflicting aims (Levänen et al., 2022). Table 1 below, which we have compiled from Clauss (2016), Kindström (2010) and Rosca et al. (2016), lists other parameters that characterise frugal business models.

We explore these insights in our case study of Philips Community Life Centres programme, a commercial intervention in primary healthcare in Africa that also has a social mission. The findings enable us to identify the core drivers of the frugal business model innovation process. We report the details in the next section.

Table 1
SDG 3 performance indicators on countries with Philips CLCs. Source: Sachs et al. (2021).

Health indicators	Kenya	South Africa	DR Congo	Ethiopia
Maternal mortality rate (per 100,000 live births)	342 (2017)	119 (2017)	378 (2017)	401 (2017)
Neonatal mortality rate (per 1000 live births)	21 (2019)	11.5 (2019)	19.3 (2019)	27.6 (2019)
Mortality rate, under-5 (per 1000 live births)	43.2 (2019)	34.5 (2019)	47.8 (2019)	50.7 (2019)
Incidence of tuberculosis (per 100,000 population)	267 (2019)	615 (2019)	373 (2019)	140 (2019)
Life expectancy at birth (years)	66.1 (2019)	65.3 (2019)	64.7 (2019)	68.7 (2019)
Births attended by skilled health personnel (%)	61.8 (2014)	96.7 (2016)	94.4 (2015)	27.7 (2016)
Surviving infants who received 2 WHO-recommended vaccines (%)	89 (2019)	72 (2019)	73 (2019)	58 (2019)
Universal health coverage (UHC) index of service coverage (worst 0–100 best)	55 (2017)	69 (2017)	39 (2017)	39 (2017)

3. Research design, data collection and analysis

3.1. Case description

Royal Philips N.V. is a multinational technology organisation headquartered in Amsterdam, The Netherlands. The organisation has been operating in the primary healthcare space in Africa as 'Philips Healthcare Africa' for about 20 years now, first through an ongoing not-for-profit Health Programme that began in 2002. In 2014, Philips launched an Africa innovation hub in Nairobi, Kenya to conduct research and development on a commercial venture for primary healthcare dubbed the Community Life Centre (CLC). The CLC is a primary healthcare facility that offers essential health services and products needed to prevent disease, promote health and manage illness, with a particular focus on maternal, child and reproductive health.

Primary healthcare in many parts of Africa is severely underdeveloped. Among the challenges of healthcare delivery, there are severe infrastructural deficiencies such as a lack of electricity, water and basic sanitation, a lack of or under-developed healthcare facilities and equipment, a lack of qualified healthcare workers, and poor referral systems. Further, the primary care market is opaque; specialised knowledge about customer needs, tastes and preferences is scarce, and where available, is tacit rather than codified, particularly in rural areas where communities rely more on traditional approaches to medicine. These issues are germane in varying levels to the targeted markets for the CLC, namely, the DRC, Diepsloot in South Africa, Northern Kenya, South-eastern Kenya, and many parts of Ethiopia. Table 1 below provides a snapshot of indicators related to SDG 3 for the countries in which Philips CLCs have been deployed.

The CLC programme first started by deploying a CLC in 2014 in Githurai Langata, Kenya—at the time a semi-urban area near Nairobi, followed by a mini-CLC in Tadu Village in the Democratic Republic of Congo in 2016. In 2017, another CLC was deployed in Mandera, a remote area in Northern Kenya. In the same year, a mobile CLC was set up in Diepsloot, a densely populated township in Gauteng, South Africa. In 2018, three CLCs were rolled out in Makueni, Kenya, and another CLC in Homabay county in Kenya in 2019. CLC programme then began pursuing projects in Ethiopia and West Africa, and these are still under development. The case study analysis in this paper focuses on the evolution of the business model underlying the CLC programme. Previously an initiative under Philips' corporate venturing programme, the CLC programme is being mainstreamed in the organisation, and thus, is under scaling up and commercialisation.

The CLC research and development process was done in collaboration with local governments and communities. Pre-existing healthcare facilities upgraded into CLCs were owned by local governments. Often, these were community-level primary care facilities run by a clinical officer or medical doctor, nurses, a pharmacist, and a facility manager. Local governments were in charge of financing operations in the health facilities. The local community has oversight on the facility through officers they elected to sit in facility management committees.

In the context of BOP research and the frugal innovation discourse, the Philips CLC case is unique: 1) Philips N.V., which is a technology firm is diversifying its product offerings by entering the service industry in Africa for the first time in what the literature refers to as 'servitization' (Visnjic et al., 2016); 2) it is entering the state-controlled public service domain of primary healthcare, and thus, it must be not only frugal to cope with extreme resource constraints but also be innovative at the institutional level. The single case study will enable exploration of the normative issues around business model innovation and organizational strategy from an interpretative standpoint—a common approach used particularly in empirical studies focused on BOP markets (Ausrød et al., 2017; Goffin et al., 2019).

3.2. Data collection

Given that this is a longitudinal qualitative study, we gathered data on Philips CLCs spanning from the year 2014 when the CLC programme started, until 2020. Data was collected from a variety of sources: participant observation, documentary evidence, and in-depth interviews conducted intermittently between February 2017 and April 2019. Semi-structured interviews were conducted with individuals involved in the research and development process of the CLC, i.e., research scientists and venture managers at the Philips Africa Innovation Hub based in Nairobi and the research headquarters in Eindhoven and Amsterdam, The Netherlands. Interviews were also done with CLC staff in Kenya, among them, the resident medical doctor, clinical officers, nurses, facility manager and pharm technologist, were also interviewed to collect evidence on the day-to-day operations of the CLC. Further interviews were conducted with officials of the County Governments of Kiambu, Makueni and Homabay in Kenya, particularly officials of the county health department that were directly involved in the development, launch and monitoring and evaluation of the CLCs. Each interview, which lasted between 36 min and 3 h, was captured via audio recording (see appendix for a list of interviews).

A wide array of documents was also collected in addition to the interview data, including data on the CLCs in Tadu Village and Diepsloot. Philips availed documentation generated by the innovation hub on the co-creation processes with the community, the components of the CLC, the innovation process followed to develop and commercialise ventures, and project management procedures. The documentation shed light on Philip's internal thought processes as the CLC evolved, and the organisational framework that supported its development.

3.2.1. The analytical approach

In this paper we explore how an MNE engaged in business model innovation through time to create and capture value, taking into consideration the array of external actors involved to realize the product. Investigating organisation-level processes naturally lends itself to an inductive, exploratory qualitative approach. Thus, we used qualitative content analysis to analyse the data, inspired by the review by Duriau et al. (2007).

We consider the business model of each CLC as our unit of analysis, and as indicated in Table 1, we focus on three main components of each CLC's business model to maintain simplicity needed to trace changes in each element, i.e., the value proposition, value creation and value capture (see Bohnsack et al., 2014, Hossain, 2021 and; Oskam et al., 2021 for a similar approach). Thus, our content analysis started with these analytical categories from the business model literature, then we derived business model sub-elements from Clauss (2016), Kindström (2010), and draw on the work of Rosca et al. (2016) and to identify frugal parameters of each business model sub-element. This framework enabled us to analytically and iteratively identify the frugal business model elements in Philips' CLC programme as it evolved.

Data analysis was conducted in four main stages following the procedure recommended by Eisenhardt (1989) and Yin (2009). First, we assembled all of the data gathered from the interviews and the documentary evidence for each of the CLCs. As already indicated, the CLCs studies were deployed between 2014 and 2019; thus, we constructed a chronology of events relating to the development of the CLC programme in different contexts.

Secondly, we undertook a descriptive coding process to identify various strategic choices for each CLC from three dimensions: the value proposition, value creation and value capture. The codes were broken down further using the framework in Table 2, i.e., the target market and the value network involved in creating value, and the financing model for value capture.

Thirdly, we identified differences or changes across the elements in the CLC business models using focused codes. In a longitudinal study, analysing change requires at least two reference points through time. We

Table 2
The analytical framework used to map CLC business models, aggregated from Clauss (2016), Kindström (2010) and Rosca et al. (2016).

Business model element	Business model sub-elements	Frugal parameters
The Value Proposition	- Offerings - Product/service flows - Solutions - (New) customer benefits - Technologies to be embedded into products and services	Affordability, good-enough products and services, basic functionality, improved health and standard of living, jobs creation, low total cost of ownership, robustness, ease of use, economies of scale
Value creation –The Target Customer	- (New target) markets - Positioning - (Market/Customer) segments - Presence	Low-income households, poor people, base of the pyramid, developing countries
Value creation – The Value Network	- (Internal and) external organization - Partnerships/alliances - Networking - Suppliers - (Distribution) channels	Contract production with local suppliers, deep procurement approach, social and micro-franchising
Value capture – The Financing model	- New revenue models (revenue streams, pricing, profit formula, monetization)	Low margins and high-volume orientation.
Value capture –The Costing mechanism	- New cost structures	Low price, no frills structure, limited use of resources, reuse of existing components, ease of use and cutting-edge technology, economies of scale

adopt a 'from-through' approach as described by Saldaña (2003), which a temporal-based perspective that details the evolution of a journey to outline the process of change. We focus on several snapshots of time between 2014 and 2020, where each snapshot is exemplified by the introduction of a new CLC in the programme. According to Strauss and Corbin (1988), change may occur in stages and phases through time, and can also be examined in terms of sequences or shifts in the nature of action/interaction. In our case, change was observed or inferred when a shift in one or more elements of the preceding business model was noted in the new CLC, e.g., a change in the core product offering, a change in the target market or geographical presence, or a change in the revenue model or cost structure. Based on the results, we classified the models into three business model archetypes as illustrated in Fig. 1. Elements that changed were labelled as dynamic elements, and those that did not change were labelled as static elements.

Fourth, we revisited the changes in the elements and investigated how and why those changes occurred. We conducted a cross-analysis of the CLC business models with the objective of developing propositions, following the approach of Eisenhardt and Graebner (2007). We looked at internal factors or events linked to those changes, e.g., the internal strategic orientation, financial resources, decisions to target certain markets, etc. We similarly explored external factors and events that may have occasioned the shift in the model such as relationships with and expectations of external stakeholders, available technologies and infrastructures, regulation, etc. We further explored how the perception of value from the perspective of the major stakeholders involved influenced the design of the business model.

This coding process was conducted by one of the authors and validated by the other two authors. To avoid misinterpretations and ensure that the final themes adequately reflect the phenomena, the findings were shared with three of the interviewees from Philips and with other researchers in the project. The coding process was done using computer-aided qualitative data analysis software, specifically, MAXQDA.

4. Findings

Our findings showed that the CLC business model has both static and dynamic elements, as described in this section (see Fig. 1 for an illustration of the business models that Philips has developed through time and implemented in different contexts). It emerged that the value proposition across the CLC business models did not change over time. Further, the costing mechanism of value capture also did not change over time. However, the financing model, the target market and the value network shifted across various business models. We explain further below.

4.1. Static elements of the business model

4.1.1. The value proposition

The commitment that we have really made through the CLC programme is that it is going to be applicable to hard-to-reach regions and marginalised populations. This means that there is really no public health system in most of the contexts where the CLC is going to be deployed.

This statement made by the Senior CLC Research Scientist captures the philosophy behind Philips' intervention in primary healthcare in Africa. More specifically, the value proposition of the Community Life Centre (CLC) is to improve access to primary healthcare in low resource settings by i) bundling technology with healthcare services in a turn key solution, ii) community engagement, and iii) socioeconomic development of the surrounding environment. The technology package includes solar power for a reliable and clean energy supply, efficient and durable indoor and outdoor LED-lighting to enable extended clinic opening hours and provide security to patients and staff, health care equipment to enable patient monitoring, diagnosis and triage, laboratory equipment for tests in antenatal care, refrigeration to prevent spoiling of vaccines, IT-solutions to manage and store patient data, and water supply and purification to prevent waterborne diseases (CLC Brochure). Part of the CLC offering is a long term comprehensive remote or on-site monitoring and support service to ensure sustainability and continuous improvement of health outcomes (CLC press release, 2016 [1]; CLC brochures).

A central tenet of the value proposition is the involvement of community members in the assessment and design of the CLC. Through co-creation, the solution is configured to the needs of the facility and the local environment. The community health workers and facility staff are also trained regularly to effectively manage the new workflow and use the medical equipment and IT system effectively. Finally, the CLC is designed in a way that transforms a health facility into a community hub. Solar-powered LED outdoor lighting is installed to illuminate the area surrounding the CLC at night, improving security and extending daylight hours. Commercial facilities are set up inside and/or outside the facility to attract and stimulate local entrepreneurship. In addition, the facility sells various commodities to the community, e.g. clean water, electricity, cookstoves and solar lighting products, etc.

Philips has three CLC solution offerings: the Community Outreach Kit which is a backpack equipped with medical equipment to be used by Community Health Workers and midwives in the field; the mini-CLC which is a health post for fragile areas—sometimes post-conflict areas; and the Full CLC which is a fully-fledged primary health centre. A content analysis of the CLC brochures, press releases and interview data reveals that this value proposition remains relatively similar through the different iterations of business model innovation. However, the types of services implemented in a CLC depend on the infrastructural environment and the regulatory framework in the target market. Different

[1] CLC Press Release, Jun 12, 2016 https://www.philips.ng/a-w/about/news/archive/healthcare/news/press/2016/2016-06-12_Philips-Community-Life-Center.html.

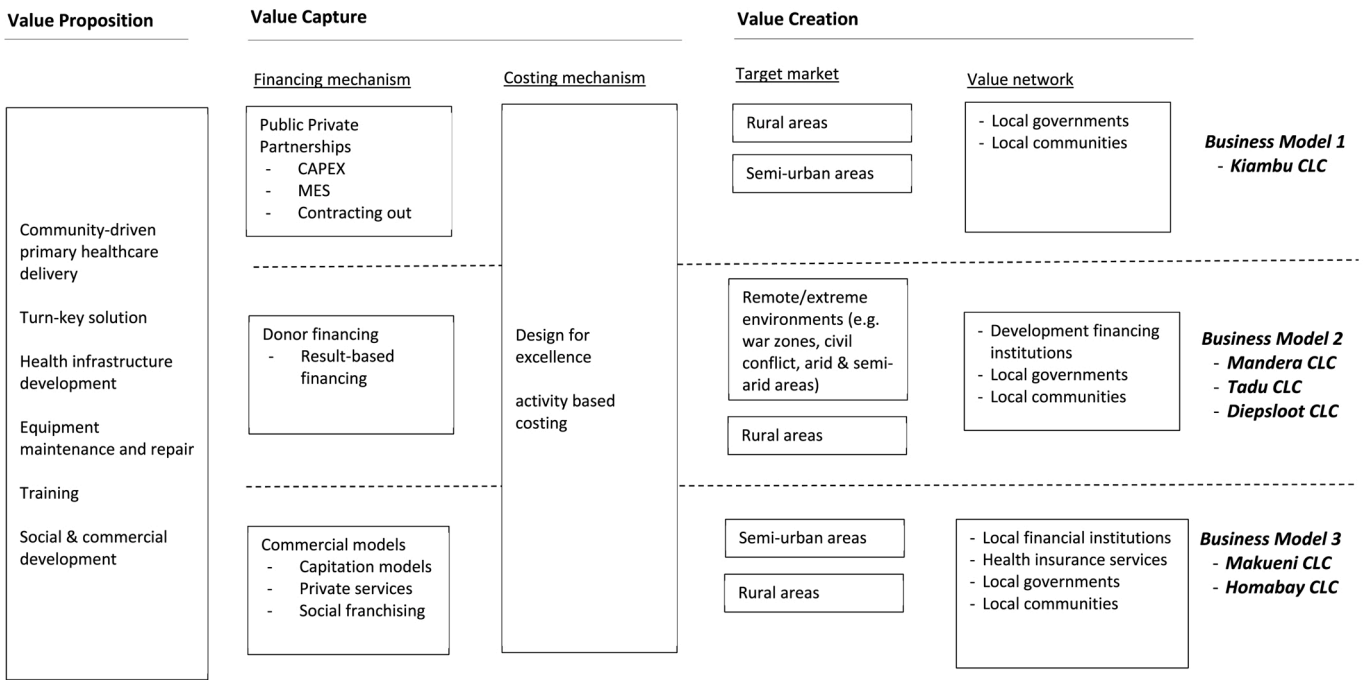

Fig. 1. Overview of frugal business models of the CLC.

modules of the CLC are deployed based on the needs and constraints of the environment, which consequently makes CLCs in different regions unique.

As we will see later, Philips emphasises different aspects of the value proposition whenever it engages with different types of financing partners in the corresponding value networks, as discussed in section 4.2 below.

4.1.2. *The costing mechanism*

Given that the CLC is being deployed in low resource settings, Philips is guided by the philosophy of reducing cost while maintaining high quality throughout the end-to-end process. However, the Senior CLC Research Scientist emphasised that "*cost must be evaluated in the context of the whole ecosystem*", as primary healthcare processes in low resource settings are prone to leakage and waste, and there is a chronic scarcity of funding.

The costing mechanism in the design phase of the CLC is based on the Design for Excellence (DfX) methodology which "considers each and every factor that can influence a product's value or cost – from concept to delivery – and identifying the 'golden' combination that will deliver the very best results at the lowest possible investment" (Philips Innovation Services). The DfX lens enables Philips to launch low-cost versions of existing technologies and services in the BOP environment by optimising different combinations in a way that increases value while reducing cost.

At the product delivery phase, Philips bases it costing mechanism on activity-based costing. Philips first establishes the cost of the "minimum viable CLC proposition for scalability" (Internal document, CLC version 1.0, 2016), given that the CLC is a modular platform. Additional costs are computed based on the unique requirements of the client that go over and above this core package. These auxiliary costs may be eliminated in instances where the client is financially constrained. The Senior CLC Research Scientist elaborates:

> There are cases where a government is not in a position to provide the necessary functions which are needed for a comprehensive primary care facility. Therefore, we need to scale down our scope of work based on what the government or the partners cannot do in a given region. This is why we have this concept of a miniature CLC. When we know what the government can pay for, [we determine] the minimum we need to provide so that this actually works out to be better.

As the Mandera CLC Project Manager explained below, the costing mechanism is standard across the different business models deployed or under development. The costing of a CLC is based on the package of technologies or services that a client requires.

> For a unit of the CLC, based on the assessment we cost the equipment and the training. It doesn't really change much though Kiambu still remains a learning area for us. The only thing that might change is when a client wants to prioritize something different. But this can't affect our costing because if a client needs additional things to be put in place, we'll ask for extra payment for that.

4.2. *Dynamic elements of the business model*

4.2.1. *The target market, the financing model, and the value network*

While there is little variation in the costing mechanisms applied to the CLC, our findings reveal that there is a dynamic interaction between the financing model, the target market and the value network. Thus, we will tackle these elements simultaneously in this section. The findings in this section show that financing opportunities determine the target market and potential partners in the business model, which in turn induces subtle shifts in the value proposition. Although the value proposition is relatively static, Philips emphasises different aspects of the proposition depending on the potential financing partner, who, as it will become evident, have different priorities. Therefore, the financing model drives the business model innovation process. We now analyse how Philips is experimenting with new financing options and related value networks as it considers new markets for the CLC platform.

During the early phases of the CLC venture, i.e., around 2012, Philips expected that they would exploit public funds to finance primary healthcare delivery at their CLCs, as is common in Western countries. However, during their initial assessment, Philips found that public healthcare expenditure in most African countries is very low. Further, more public funds are spent on higher-tier healthcare facilities like district-, provincial- and national-level hospitals and tertiary care rather than on primary healthcare where the CLC value proposition is based. As the Head of Research Africa noted:

> [Financing] is a challenge that [local governments] have but the willingness is there. And this is a new field and in general there is a challenge on how to finance this type of solution.

Consequently, primary care, particularly in rural areas or in regions with low population densities, remains underfunded and sometimes underprioritized in state budgets. Thus, private actor like Philips that wishes enter the primary healthcare space must explore other opportunities to raise the capital investment.

From our preliminary findings, it was clear that the CLC requires a significant upfront capital investment to conduct assessments, engage in co-creation exercises, design the facility and related workflows, purchase infrastructure and to train staff, access to financial resources drives the evolution of the business model. Further considerations must also be made in the business model from the outset on how recurrent operating costs of the facility will be sustained. Given this foundational financial challenge, we now present the core business models that Philips developed through time based on different financing models. We also discovered that there is a relationship between the financing model under consideration and the target market segment (as illustrated in Fig. 1), which we also explore below.

4.2.1.1. Business model 1: public private partnerships (PPP) (2014 onwards). Public-private partnerships (PPP) are seen as an effective way to capitalize on the relative strengths of the public and private sectors to address problems that neither could tackle adequately on its own. For the CLCs, Philips has mobilised different public private partnerships as a funding and operational model to leverage its competence in infrastructure development and medical technology innovation, and governments' capacity to manage medical human resources, and supply medical commodities.

In 2014, the first PPP model envisioned for the CLC was the capital expenditure (CAPEX) model. The Venture Manager CLC described in simple terms as follows: "*we [Philips] make a proposal and they [governments] have to pay, and then we supply*". In healthcare, CAPEX is a conventional approach used to finance significant investments in brick and mortar and medical equipment upfront, where a hospital or a government lays out the investment. However, as national and local county governments are financially constrained, making huge capital outlays independently is challenging.

To ease the burden on governments, the Managed Equipment Services (MES) model was proposed around 2016 as an alternative financing model. In a MES arrangement national or local governments invite private providers of healthcare infrastructure, equipment and services such as Philips to bid to supply, install, test, commission, as well as maintain, repair, upgrade and replace equipment at regular intervals for an agreed contractual period. The government then makes regular, prearranged payments based on agreed performance parameters. This approach has already been tested in Kenya for tertiary healthcare financing. As a potential financing model for the CLCs, the MES PPP model envisions long-term financial engagements with either local or national governments.

Finally, the third PPP model under consideration for the CLCs was the contracting-out model. "*We are looking at PPP together with AMREF [where] we run health facilities for the government through the contracting-out model*", observed the CLC Venture Manager. PPP models in healthcare financing have become very attractive to national and local governments not only in Kenya, but across developing countries as they enable governments to finance capital expenditure and to outsource the technical aspects of maintaining infrastructure to more specialised and competent partners such as Philips. In fact, the Minister of Health for Makueni County where a CLC is under consideration remarked as follows:

> The County government is not best positioned to provide best quality primary healthcare. What the government should do is set the boundary conditions and the governance around it and then let private sector, NGOs and companies actually run the clinic because they can do it more efficiently .[2]

In order to collaborate with local governments in PPPs, Philips had to orient its CLC value proposition towards the priorities of the government such as efficiency and improved health outcomes. For instance, in Kiambu County, the local County Health department is focused on extending primary healthcare services to excluded communities in a sustainable way. Therefore, social inclusion and cost-effectiveness were at the core of their needs. In response, Philips had to "*demonstrate long-term value-based efficiencies*", which meant that they had to "*sit together with [the local government] and try to figure out what is value, and how the CLC solution can be best customised to best suit their requirements*" as the Head of Research Africa explained.

PPP models are particularly attractive to Philips' CLC programme as they engender local ownership at the policy or regulatory level. Further, PPPs enable Philips to enter into long term agreements with governments necessary to sustain the collaborative model underlying the CLC platform. Pure PPP models for the CLC where governments independently engage with Philips are only viable in semi-urban and rural areas. There, local governments have some capacity to finance either the capital investment or the routine CLC operating expenses (human resources and medical commodities). Such arrangements are even more challenging in fragile or conflict environments where local governments virtually have negligible budgets for primary healthcare.

4.2.1.2. Business model 2: PPP and donor financing (2016 onwards). Given chronic financial constraints of national and regional public healthcare budgets in sub-Saharan Africa, many primary care initiatives are financed by development aid from Western governments and multilateral donor agencies such as the World Bank, United Nations organisations, United States Agency for International Development, United Kingdom's Department for International Development (DFID), and healthcare organisations such as AMREF and International Committee of the Red Cross.

For approximately nine years prior to the launch of the CLC programme, Philips Foundation had a vast Health Programme focused on strengthening primary healthcare systems in sub-Saharan Africa, in collaboration with donor partners, largely targeted at fragile and conflict regions. For example, Philips Foundation continues to collaborate with the Red Cross to provide relief to people in regions affected by humanitarian crises by improving healthcare, providing powerful solar lighting to enhance safety in affected communities, and understanding how existing technology or sustainable practices could be utilized in emergency management.

Drawing from the experiences of Philips Foundation's Health programme, the Africa Innovation Hub saw the potential to rapidly scale up the CLC programme in fragile environments through donor funding. Thus, Philips became more deliberate in conceptualising donor-funded business models for the CLC in 2015. Accordingly, Philips started to develop internal protocols to fundraise for the CLC and to engage with the non-governmental sector. "*We have a team that actually looks at public and external* funding. *They try to match the need and the opportunity in the market with opportunities with respective donor* funding" stated the Head of Research Africa.

In order to scale up its potential to roll out CLCs through this donor-driven business model, Philips started to engage in advocacy among multilateral organisations with the aim of extending its value network and exploring non-conventional opportunities in the development aid arena. The Head of Research Africa further explained:

[2] Evolved Healthcare: Makueni's Trailblazing Experiment in Providing Universal Health Coverage. https://www.theelephant.info/features/2018/01/11/devolved-healthcare-makuenis-trailblazing-experiment-in-providing-universal-health-coverage/.

> [The management] is promoting [the CLC] in UN assemblies and at World Economic Forum and SDG platforms. […] Money can come from different angles: NGOs, trust funds, can be development banks, can be foundations, etc

With regard to the target market, donors are more attracted to fragile, high-risk environments rather than urban or even semi-urban areas where communities have a better chance to access the public primary healthcare system. Donors feel that in fragile environments, e.g. regions with civil conflict, natural disasters, political instability and other humanitarian crises, or in absolutely marginalised areas where local governments or other private sector actors avoid, their investments are likely to make more significant impacts. Given the untested nature of these environments, donors are willing to make more high-risk investments. This aligns well with the CLC programme which, itself, is an experimental project. The Head of the Philips Africa Innovation Hub explains:

> The CLC … hasn't demonstrated itself with the impact case. We need to find our first financier; somebody that is willing to say, "Okay, I want to experiment and try something new". With the CLC, that is easier in fragile regions. We sold a CLC in Mandera in northern Kenya where Al-Shabaab is still hanging out. Another CLC was sold out in north-east of DRC, another place like that. So, it might be easier to sell a product in more high risk markets.

Thus, the value proposition for this type of donor would emphasise the potential return of a high-risk primary healthcare intervention in markets where no other actors are willing to enter, or have the competency to design feasible interventions. On the other hand, however, there are donors that would like to see expected tangible, measurable impacts upfront before investing in projects such as the CLC. Some impose stringent requirements in order to invest. Establishing such measurable impacts is challenging in an early-stage project like the CLC where outcomes would only be visible after a number of years of operation. This poses a dilemma for Philips on how to structure its value proposition for this audience, as the Venture Manager CLC explains:

Currently, we are selling inputs such as equipment and training. But the trend—certainly in the donor community—is towards selling outputs and outcomes rather than inputs. So, we are looking at what that would mean for us. Rather than being paid for an ultrasound or whatever equipment we have supplied, suppose we are paid for increasing the number of ante-natal care visits, or even further reducing maternal mortality. That completely changes the picture. Of course, the big issue there is that, can we really take responsibility for those outputs and outcomes because we only provide part of the solution?

A final concern with the donor-funded financial model is sustainability. While a donor may finance the capital costs, lack of a clear strategy on funding the operating costs means that the CLC facility may eventually collapse. This is a common issue with donor-driven healthcare interventions in low resource settings.

4.2.1.3. Business model 3: PPP and commercial models (2018 onwards). After implementing PPPs and donor-driven financing models, Philips started to experiment with commercial models in 2018 where revenues are generated directly and indirectly from healthcare services. Rather than using capital funds directly from the local government or donors, Philips would instead raise capital from internal resources, or enter into partnerships with commercial partners such as development banks. This investment would be recouped from revenues from fee-for-service or pay-for-performance models. Direct revenues would be generated from national and community health insurance programmes and from out-of-pocket payments for healthcare services by patients.

When evaluating commercial funding options for the initial capital investment for a CLC, Philips found that banks are generally reluctant to lend funds to budget-constrained local governments, or even to early-stage innovative projects such as the CLC. When they do, they need guarantees. As a counter, Philips may instead change the legal structure of the funding proposal by setting up special purpose vehicles (SPVs), i.e. a separate legal entity to manage the funds similar to a privately owned entity. The enterprise would then find alternative income streams—apart from contributions by the local county government—flowing into the SPV to service the loan.

The first alternative revenue streams that Philips is experimenting with is based on capitation fees. In general, capitation refers to a funding arrangement in which a health care organization is provided the funds for the cost of care and for the services rendered in the management of care. This model is being tested in three CLCs in Makueni County in Kenya. The capitation fees are collected through the National Health Insurance Fund (NHIF) currently under expansion. "*We enrol people into NHIF (through our partner AMREF which has a licence to do so). We have an agreement with NHIF that for every person enrolled within the catchment area of these facilities, they will pay us a fixed $10 per annum capitation* fee" explained the CLC Venture Manager.

The second alternative income stream is based on revenue from private services offered within the primary care facility, which Philips began to implement in 2019. Philips would, within the CLC, establish auxiliary healthcare services that are not mandated under the Kenya Essential Package for Health (KEPH) for Level 2 or 3 facilities. While patients would be able to access essential primary care services in the facility using vouchers or through their health insurance systems, a separate charge or fee would be applied when the patients use these 'private' services such as ophthalmology or ultrasound services. Patients who do not have health insurance would pay for these services out-of-pocket. "*People are willing to pay for this kind of service instead of travelling to another place. So at the end the facility will make more money, more constantly*", elaborated the Head of Research Africa.

Philips is also investigating the potential for social franchising as an alternative commercial model, where various franchising models were under consideration from 2020. The most promising franchising arrangement would focus on creating a 'CLC for franchise'. In general, the arrangement would involve a contract with an investment partner such as a venture capitalist, an investment fund or a development bank, and independent private healthcare facilities and entrepreneurs who would deploy CLCs in a given region. For instance, Philips in 2020 was exploring how to partner with Tunza Family Health Network, an existing health social franchise owned by PS Kenya which has a network of about 800 clinics. The CLC Venture manager explained:

> We want test what impact the CLC will have on their facilities. We want to implement the CLC in some of their existing facilities, and then look at what it does to the health impact of those facilities, but also the financial impact. Because, in the end, those are businesses, we want to see if the investment in the CLC does pay itself back through additional revenues.

In such an arrangement, Philips provides training, infrastructure support and marketing services. Out-of-pocket payment by patients would cover the franchise's operational expenses, and where relevant, remittances from health insurance funds or even capitation fees from local governments. The franchising approach enables rapid scaling up by organising small providers into units that are large enough to yield returns to scale in the investments in infrastructure, training, support and supervision. Cross-subsidies may also be arranged.

A significant difference between commercial models and donor-funded models or traditional PPP models is the fact that local governments can completely outsource primary care services to private entities to manage. Philips and its partners would be responsible for the day-to-say management of public healthcare facility. Thus, these commercial models mimic privately owned and run healthcare facilities, which, according to the CLC Venture Manager, has the benefit of not only "*improving the health outcomes, but also contributing to making the model financially sustainable and bankable*". Nevertheless, fully commercialising key public services such as primary healthcare, particularly for the

lower-income segment of the population may raise concerns about the governments' loss of control and accountability for such essential services. The risk is that commercialised primary healthcare may introduce corporate practices that make the service unaffordable to targeted communities. The facilities may in the long run be unwilling to serve uninsured patients who currently can access primary care from Level 2 and 3 facilities at no cost.

Testing these commercial models in sub-Saharan Africa is crucial for Philips given the expectation that in the future, as donor funds dry up and countries develop economically, commercial models may become a primary way of financing primary healthcare services. While these models enable Philips to access commercial funding and develop a potentially innovative self-sustaining revenue model for primary care, the financing mechanism presents the risk that the initial investment is not recouped if the model fails, as the Head of Research Africa pointed out:

> Philips will pre-invest […]; when the CLCs start to perform much better, then the government will pay for the better performance. … But if it's not working, it's just Philips that is losing its money and not the government in this case.

4.3. Financing frugal innovation through hybrid models

The previous section focused on abstracted or 'pure' financing models that drove business model innovation for the CLC platform. In practice, Philips in collaboration with various stakeholders implemented more hybridized financing models. Table 3 outlines the hybrid financing models in the CLC programme since the launch of the first CLC in Kiambu County in Kenya in 2014–2019. At the beginning of the programme, pure public private partnership (PPP) models were originally the foundational element of the business model both from a financing and co-creation perspective. However as the programme evolved, there was a need to explore alternative funding mechanisms. PPPs remained a core element of subsequent business models, but they were supplemented first with donor financing, and later by commercial revenue mechanisms. Below we briefly describe the three main hybrid models implemented in different locations and speculate on the potential consequences on the scalability of the model.

The Githurai-Lang'ata CLC in Kiambu County, central Kenya was established as a PPP between Kiambu County government and Philips. To finance the facility, the county government donated the land, refurbished existing buildings and put up additional buildings. The county also pays for operational costs related to human resources and medical commodities using public funds. Philips covered the capital outlay related to the medical equipment, the solar energy system, and indoor and outdoor lighting, and the IT system. Philips will continue to maintain, repair and upgrade the equipment used in the facility.

According to both Philips and the county government, this cost-sharing approach was designed to facilitate experimentation and piloting of the CLC model to derive lessons for both partners. As the Philips Head of the Africa Innovation Hub reiterated:

> Kiambu was a living lab. So here we didn't know yet what an ideal primary care clinic looks like. So there we said, "Hey, government, pick one of your best performing clinics and then we will just try and improve it as much as we can and you also make your improvements". That co-created the ideal clinic, that is how Kiambu got started so I will call it a living lab—a place where the government and Philips are experimenting.

Thus, this model—while suitable for experimentation—is not scalable. However, if enables both partners to have relatively equalised levels of ownership, share the risks of experimentation in frugal innovation and PPPs in primary care.

4.4. Donor-funded PPP models

The CLC in Mandera County in North-Eastern Kenya, launched in June 2017, was developed as a collaboration between UNFPA as the financing partner, Philips as the implementing partner, and the Mandera County government. The CLC was also launched under UNFPA's Every Woman Every Child initiative in which the Ministry of Health and county governments of the 6 counties in Kenya that contribute almost 50% of all maternal deaths in the country. A collective, dubbed The Private Sector Health Partnership in Kenya – PSHP Kenya, formed by private sector partners including Philips, Safaricom, MSD, Huawei and GlaxoSmithKline was also involved.

A different multi-actor donor-driven financing model was applied to the installation of a mobile clinic in 2015 in the populous townships of Diepsloot, Cosmo City and Orange Farm, in Northern Johannesburg. This CLC was developed based on a collaboration between Philips South Africa, RhizaFoundation and two corporate social investment partners: Nozala Trust, a South African public benefit organisation that supports women entrepreneurship, and the Industrial Development Corporation (IDC), a state-owned development finance institution. The mobile clinic eventually grew into a Mini-CLC due to increased demand for primary care from the community in Diepsloot.

As these models bring together myriad organisations to fund and implement the CLC, further complexity on value capture arise.

4.4.1. PPP commercial models: the makueni CLC

The three CLCs in Makueni County in Kenya are being piloted under the 'Partnership for Primary Care (P4PC)', and it is seen as "a business model to revolutionize primary care in Africa." (Health, 2020). The collaboration consists of Philips, the Makueni County government, Amref Health Africa and the Dutch development bank FMO. The role of the partners in the model is as follows, as described by the CEO Amref Health Africa:

> In simple terms, Makueni County is responsible for policy, provision of healthcare professionals and drugs and supplies, Amref is taking the lead in training health workers and managing facilities, FMO is providing catalytic financing and financing expertise, while Philips is providing health system infrastructure and medical equipment.

The objective for such an approach is that once the model proves

Table 3
Financial models in the evolution of CLC business models.

Year	CLC site	Business Model	Target Market
June 2014	Githurai Langata CLC, Kenya	PPP	Semi-urban
Nov 2016	Tadu Village CLC, DRC	PPP & Donor financing	Fragile
Jun 2017	Mandera CLC, Kenya	PPP & Donor financing	Fragile
Aug 2017	Diepsloot CLC, South Africa	PPP & Donor financing	Urban (slum)
Jul 2018	Makueni CLCs, Kenya (Emali Model Health Centre, Tutini Dispensary and Matiku Dispensary)	PPP, Capitation Fees, Private Services	Rural/Semi-urban
2019	Homabay	PPP, Capitation Fees, Private Services	Rural/Semi-urban
2020	Ethiopia	PPP & Donor financing	Fragile
2020	West Africa	Social franchising	Rural/Semi-urban

Financing a Frugal Living Lab: The Githurai-Lang'ata CLC.

itself, it will be less challenging to find development banks willing to put up significant capital outlays to scale up the approach. This approach circumvents the need to generate evidence of impact in order to find donor financing. Upon the commissioning of the facility, multiple revenue streams are used to finance the primary care services, among them, county financing, user fees, and income from commercial services. (Commercial healthcare services like ultrasound services, or non-healthcare commercial activities, e.g., selling milk, charcoal, textile services, etc., were established adjacent to the clinic).

5. Discussion and conclusion

In this paper, we analyse how an MNE that is developing interventions in primary healthcare at the BOP environment engages in frugal business model innovation. We adopt a longitudinal approach to identify what drives business model innovation. Specifically, we identify which elements of the business model shift, and the implications of such shifts on value creation and capture. From our findings, we make some propositions below that could apply to frugal business model innovation targeting different resource-constrained environments.

Business model innovation is often associated with firms that are seeking for or entering new markets (Saebi et al., 2017). Therefore, business model innovation involves exploring new ways of creating and capturing value, often by challenging existing industry business models in certain geographical markets (Breuer and Lüdeke-Freund, 2017; Chesbrough, 2010). Our study reveals that in frugal business models, value capture could be the foundational driver of the business model innovation process. We argue that this is due to often severe capital constraints in base of the pyramid markets, particularly for MNEs which operate in more industrialised markets where revenue models are based on conventional commercial revenue streams from customers or clients. Thus, MNEs entering these environments must explore alternative innovative financing models that enable them to generate social value while simultaneously capturing economic value. This is more germane in a service-oriented sectors like healthcare where large capital investments in infrastructure must be made upfront, while revenues are generated over time (Ramdorai and Herstatt, 2015). Sarkar and Mateus (2022a) argue that lack of financial resources to acquire standard healthcare tools and equipment is a trigger for the enactment of frugal innovation in healthcare. Our case study shows that local government are financially constrained and as a consequence, they are not able to make huge capital outlays to purchase medical equipment and build infrastructure for primary healthcare. For Philips entering this setting, the effort to find sustainable financing models drives the innovation process.

Thus, we propose that in a service-oriented sector such as primary healthcare, the most critical element of frugal innovation is the financing model. This perspective extends the frugal innovation literature where much of the analytical focus has been on the product-oriented and process-oriented aspects of the value creation process (Pisoni et al., 2018). Even though the literature also acknowledges that appropriate frugal business models must be developed to distribute these products to target customers (e.g. (Radjou and Prabhu, 2014)), few empirical studies examine this aspect of frugal innovation (Agarwal et al., 2017). In service sectors, frugal innovation is based on efforts to find the most optimal business model that delivers and captures value, even though frugal engineering or other cost minimisation processes may be applied to the equipment and infrastructure that delivers those services. If revenue cannot be generated from the sale of services to target customers due to low disposable incomes, then the business model innovation focuses on raising such revenues (in the form of capital) upfront. Our case study shows that an MNE therefore would invest considerable effort to experiment on different mechanisms of capturing value upfront, and the dilemmas that arise as a consequence.

Proposition 1. The frugal business model innovation process in the BoP is driven by the financing model

The literature advocates for more dynamic review of business models which change as a firm aligns to changes in external environment, or as already noted, when the firm is entering new markets (Aspara et al., 2010; Casadesus-Masanell and Ricart, 2010; Saebi et al., 2017). Our study reveals that an MNE can innovate by developing multiple iterations of the same business model by customising it to different geographical markets. This is in line with literature that show that business models are 'opened up' so as to redefine its elements (Chesbrough and Rosenbloom, 2002; Foss and Saebi, 2017), and navigating this process is a daunting task often at odds with the exiting modus operandi of the enterprise. Thus, taking the business model as an analytical unit whereby a change in one element of the model would induce shifts in other elements of the model, we found a dynamic relationship between the financial model and the target market. A change in the financing model is associated with a change in the target market. We argue that this is because different target markets provide different opportunities and constraints on what kind of funds can be mobilised to develop capital infrastructure. For instance, donor funding is more available and appropriate for fragile environments, while commercial models are applicable to semi-urban and rural areas where patients have more access to health insurance schemes or are capable of making out of pocket payments for medical services. We also found that although the core component of the value proposition remains unchanged across the different business models, the MNE makes subtle shifts in the way they package this value proposition depending on the financing partner. Like Winterhalter et al. (2017), we found that a multidimensional value proposition is implemented through the CLC.

Proposition 2. In frugal business model innovation, BoP target markets are adjusted based on financial opportunities available

The dynamic elements of the business model are supported by relatively static elements. In our case, the costing aspect of value capture, and the value proposition component remained relatively static across the three abstract business models that emerged. This approach of anchoring dynamic elements of the business model upon static elements opens up new business model innovation trajectories within the corporation. These trajectories can be adapted further to specific market segments at the base of the pyramid. In our case study, the three trajectories based on public private partnerships (PPPs), donor funding and commercial models can be developed further to create sub-models tailored to specific target markets. For instance, considering the commercial models, capitation fee commercial sub-models can be further adapted to regions where are national health insurance systems are accessible, or local governments are willing to fund vulnerable households' health care needs. On the other hand, user fee-based commercial sub-models can be developed further for relatively wealthier rural areas. This finding reinforces the perspective that organisations whose business models are path-dependent are unlikely to succeed in fragmented BOP markets where significant adaptations must be made (Bohnsack et al., 2014).

Proposition 3. The value proposition and costing mechanisms remain relatively static in an evolving frugal business model deployed in a BoP environment.

It has been argued that frugal innovation at the BOP generates greater business and social value relative to traditional innovation (Hossain, 2017). To create such value at the BOP, it is increasingly apparent that there is a need to build value networks that involve different configurations of actors with complementary capabilities, resources, and investment risks and returns (Bianchi et al., 2017; Leliveld and Knorringa, 2018; Rocchi et al., 2018). Value networks are particularly germane to efforts to address 'wicked problems' (Breuer and Lüdeke-Freund, 2017), such as primary healthcare delivery in low resource settings, as also seen in the cases of Narayana Hrudayalaya (NH) and Aravind Eye Care Systems (AECS), two low-cost specialty hospital chains in India (Ramdorai and Herstatt, 2015). Partnerships

with local governments when developing frugal products, as in our case study, has been found to be a successful strategy in the literature (Corsini et al., 2021; Levänen et al., 2022; Sarkar and Mateus, 2022b). However, for an MNE such as Philips that builds or participates in such value networks, the corporation must take into account the different conceptualisations of value by the partners involved. The corporation must also identify areas where these disparate objectives overlap, and determine whether and how it will be able to capture economic value within the network without compromising the normative orientations of network members. For instance, our case study shows that in collaborating with local governments, the MNE adapted its value proposition to appeal to the local government's mandate to deliver efficiency in public services at the most optimal cost, address social exclusion and ensure (or at least promise) sustainability of the services provided. To balance these objectives with its own objective of making profits, Philips developed a CLC business model based on the Managed Equipment Services financing model which enables the local government to pay for the use of equipment and services over a longer period of time while Philips delivers efficiency as promised. In this way, Philips can spread risk and recoup profits over time. Similarly, raising capital from donor funds meant that Phillips needed to demonstrate improvements in health outcomes from the CLC and adjust its value proposition accordingly in order to receive the lump sum capital investment. In effect, this was an effort to embed the values of these partners into the design and orientation of the business model (Breuer and Lüdeke-Freund, 2017). As our case illustrates, this is achieved through an iterative process whereby through experimentation and action learning, the enterprise adapts its roles and goals to mutual interests (Oskam et al., 2021). Failure to articulate the different parameters of value creation and capture creates the risk of disillusionment among the different partners if they are not able to appropriate value as they see it, thus compromising the sustainability of the business model.

Proposition 4. To successfully co-create value at the BOP, different framings of value among the different actors must be aligned during the business model innovation process.

Our study also shows that developing innovative financing models can enable an MNE to pursue profits in the public sector in the base of the pyramid. Commercial models seem inimical to public primary healthcare in rural areas and fragile environments where households have negligible income to spend on health, and governments struggle to finance healthcare. However, the case shows that there is potential for alternative business models such as contracting-out, voucher systems, social franchising, and capitation systems to be used to effectively transform the private sector into a conduit for public financing. This approach may in fact be more sustainable than donor-driven models that proliferate the primary healthcare space in sub-Saharan Africa. However, conflicts of interest may arise, and contracts must be designed carefully to ensure win-win arrangements for all parties.

6. Theoretical contributions

This study provides a nuanced understanding of how an MNE can navigate value creation and value capture during frugal business model innovation at the BOP. Although previous research on frugal innovation has shown that business models change (Howell et al., 2018; Rosca et al., 2016; Winterhalter et al., 2017), those studies did not show the interdependency of the changes in business model elements through time and in different markets. We systematically examine the evolution of a frugal business model and show that the innovation process is pegged on the financing model due to resource constraints at the base of the pyramid. Target sustainable markets are adjusted based on financial opportunities available. There were however no radical changes to the value proposition. Current studies in this area tend to be single or multiple cross-sectional studies that investigate snapshots of the business model, and thus, cannot effectively capture the evolution of business models and the nuances of such a process (Cao et al., 2017; Foss and Saebi, 2017; Sinkovics et al., 2014; Winterhalter et al., 2017).

The possibility that market-based approaches can be proactively harnessed to address pervasive social problems in developing contexts has been a subject of discussion in extant literature (Austin et al., 2006; Kroeger and Weber, 2014; Sinkovics et al., 2014). The most ardent proponents of this perspective are found in the BOP literature where they assert that commercial enterprises can have transformative social impact, particularly in alleviating poverty in low-income contexts (Hart and Christensen, 2002; Prahalad and Hammond, 2002). This study contributes to this discourse by demonstrating that, even though a commercial enterprise may be seeking to achieve a social mission, finding a business model that enables the enterprise to reap profits still remains the driving force behind business model innovation. Implementing a commercially sustainable venture means that the social mission will be achieved more sustainably. Therefore, these missions can be complementary.

Business model changes are pronounced when an enterprise is seeking new markets in different national contexts (Chesbrough and Rosenbloom, 2002; Foss and Saebi, 2017; Saebi et al., 2017). What was unique in this study is that, even in the same country, business models can change when the same product or service is deployed in a different locality. This shows that there is heterogeneity even within one national context, and such heterogeneity provides both constraints and opportunities that call for a rethinking of the core business model. Thus, as a multinational expands into new national markets, it must be aware of the heterogeneity in those markets and be prepared to innovate its model accordingly.

Finally, by investigating a service-oriented business model, we are address calls to diversify the literature beyond product-centred frugal innovation (Agarwal et al., 2017; Castaño et al., 2016; Kindström, 2010; Pisoni et al., 2018). We learn that services—which cannot always rely on high volume, low margin revenue models recommended for fast moving consumer goods in the BOP—sometimes require significant upfront investments that need innovative financing mechanisms. This is further complicated if the services are highly subsidized as is the case in primary healthcare.

7. Practical implications

This study provides guidance to managers interested in understanding the dynamics of business model innovation when deploying frugal services in a BOP market. Multinational enterprises may need to develop and deploy different business models as they scale their operations across different geographical contexts in developing countries. The whole business model does not need to change completely, especially when the value proposition of the service must be maintained across those markets to safeguard the core business. However, other elements may shift depending on the severity of the resource constraints of the target market.

This study also shows that business model innovation calls for continuous experimentation with different elements of a business model. An incremental approach to this process, like the one demonstrated in this study, may minimise the risk while maximizing opportunities for knowledge acquisition. Through business model innovation, an enterprise can develop a portfolio of models that can be deployed in a different geographical location that has similar contextual factors. The business models can then be refined as new knowledge becomes available.

Declaration of competing interest

All of the sources of funding for the work described in this manuscript are acknowledged below: This work was supported by the Netherlands Organization for Scientific Research [NWO grant number 313-99-314].

Data availability

The authors do not have permission to share data.

Acknowledgements

We would like to thank the participants of the European Academy of Management (EURAM) Conference in Portugal in 2019 and the Africalics Conference in Tanzania in 2019 for providing valuable feedback. We also appreciate the efforts of the editorial team and the anonymous reviewers for taking the time and effort to review the manuscript and provide detailed comments.

We thank the executives at Phillips NV in Amsterdam and Eindhoven, The Netherlands, and the research scientists at the Africa Innovation Hub in Kenya, staff at the Community Life Centres and at the various County Health departments for generously giving their valuable time for interviews and sharing information.

Finally, the authors would like to thank the Netherlands Organization for Scientific Research for supporting this research project. This article reflects only the authors' view, and any errors are the authors' responsibility.

List of interviewees

Philips staff

Head of Philips Research Africa.
Senior Research Scientist, Africa Innovation Hub.
Head of the Philips Africa Innovation Hub.
Program Manager CLC-program, Strategy & New Business development, Africa.
Senior Director: Design for Sustainability Philips Design.
Venture Manager, Philips Healthcare.

Research scientists

Project Manager, Mandera CLC.
Data Analyst.
CLC Staff.
CLC Pharm technologist.
Chairman, CLC health committee.
Clinical Officer CLC.
CLC facility administrator.
Sonographer, CLC.

Nurses CLC

Medical officer, CLC.
County Health Department (Kiambu and Makueni Counties).
Clinical Medical Services Officer.
County Chief Health Officer.
Community Health Coordinator.

References

Afuah, A., 2004. Business Models: A Strategic Management Approach. McGraw-Hill/Irwin.
Agarwal, N., Grottke, M., Mishra, S., Brem, A., 2017. A systematic literature review of constraint-based innovations: state of the art and future perspectives. IEEE Trans. Eng. Manag. 64, 3–15.
Amit, R., Zott, C., 2001. Value creation in E-business. Strat. Manag. J. 22, 493–520.
AMREF Health Africa, 2020. Partnership for Primary Care—Transforming the delivery and financing of primary care in Kenya. Retrieved from. https://www.amref.nl/media/files/Partnership%20for%20Primary%20care(1).pdf.
Andries, P., Debackere, K., 2013. Business model innovation: propositions on the appropriateness of different learning approaches. Creativ. Innovat. Manag. 22, 337–358.
Aspara, J., Hietanen, J., Tikkanen, H., 2010. Business model innovation vs replication: financial performance implications of strategic emphases. J. Strat. Market. 18, 39–56.
Ausrød, V.L., Sinha, V., Widding, Ø., 2017. Business model design at the base of the pyramid. J. Clean. Prod. 162, 982–996.
Austin, J., Stevenson, H., Wei-Skillern, J., 2006. Social and commercial entrepreneurship: same, different, or both? Enterpren. Theor. Pract. 30, 1–22.
Banerjee, A.V., Duflo, E., 2007. The economic lives of the poor. J. Econ. Perspect. 21, 141–168.
Bankvall, L., Dubois, A., Lind, F., 2017. Conceptualizing business models in industrial networks. Ind. Market. Manag. 60, 196–203.
Bianchi, C., Bianco, M., Ardanche, M., Schenck, M., 2017. Healthcare frugal innovation: a solving problem rationale under scarcity conditions. Technol. Soc. 51, 74–80.
Bohnsack, R., Pinkse, J., Kolk, A., 2014. Business models for sustainable technologies: exploring business model evolution in the case of electric vehicles. Res. Pol. 43, 284–300.
Brem, A., Wolfram, P., 2014. Research and development from the bottom up—introduction of terminologies for new product development in emerging markets. Journal of Innovation and Entrepreneurship 3, 9.
Breuer, H., Lüdeke-Freund, F., 2017. Values-based network and business model innovation. Int. J. Innovat. Manag. 21, 1–35.
Buckley, P.J., 1989. The Multinational Enterprise: Theory and Applications. Palgrave Macmillan UK.
Cao, L., Navare, J., Jin, Z., 2017. Business model innovation: how the international retailers rebuild their core business logic in a new host country. Int. Bus. Rev. https://doi.org/10.1016/j.ibusrev.2017.10.005.
Casadesus-Masanell, R., Ricart, J.E., 2010. From strategy to business models and onto tactics. Long. Range Plan. 43, 195–215.
Castaño, M.-S., Méndez, M.-T., Galindo, M.-Á., 2016. Innovation, internationalization and business-growth expectations among entrepreneurs in the services sector. J. Bus. Res. 69, 1690–1695.
Chesbrough, H., 2010. Business model innovation: opportunities and barriers. Long. Range Plan. 43, 354–363.
Chesbrough, H., Rosenbloom, R.S., 2002. The role of the business model in capturing value from innovation: evidence from Xerox Corporation's technology spin-off companies. Ind. Corp. Change 11, 529–555.
Clauss, T., 2016. Measuring business model innovation: conceptualization, scale development, and proof of performance. R. Manag. 47, 385–403.
Corsini, L., Dammicco, V., Moultrie, J., 2021. Frugal innovation in a crisis: the digital fabrication maker response to COVID-19. R. Manag. 51, 195–210.
Cunha, M. P. e, Rego, A., Oliveira, P., Rosado, P., Habib, N., 2014. Product innovation in resource-poor environments: three research streams. J. Prod. Innovat. Manag. 31, 202–210.
Demil, B., Lecocq, X., 2010. Business model evolution: in search of dynamic consistency. Long. Range Plan. 43, 227–246.
Duriau, V.J., Reger, R.K., Pfarrer, M.D., 2007. A content analysis of the content analysis literature in organization studies: research themes, data sources, and methodological refinements. Organ. Res. Methods 10, 5–34.
Eisenhardt, K.M., 1989. Building theories from case study research. Acad. Manag. Rev. 14, 532–550.
Eisenhardt, K.M., Graebner, M.E., 2007. Theory building from cases: opportunities and challenges. Acad. Manag. J. 50, 25–32.
Foss, N.J., Saebi, T., 2017. Fifteen years of research on business model innovation: how far have we come, and where should we go? J. Manag. 43, 200–227.
George, G., McGahan, A.M., Prabhu, J., 2012. Innovation for inclusive growth: towards a theoretical framework and a research agenda. J. Manag. Stud. 49, 661–683.
Goffin, K., Åhlström, P., Bianchi, M., Richtnér, A., 2019. Perspective: state-of-the-art: the quality of case study research in innovation management. J. Prod. Innovat. Manag. 36, 586–615.
Halme, M., Lindeman, S., Linna, P., 2012. Innovation for inclusive business: intrapreneurial bricolage in multinational corporations. J. Manag. Stud. 49, 743–784.
Hart, S.L., Christensen, C.M., 2002. The Great Leap: Driving Innovation from the Base of the Global Pyramid. Retrieved from. http://www.hbs.edu/faculty/Pages/item.aspx?num=13615.
Hossain, M., 2017. Mapping the Frugal Innovation Phenomenon. Technology in Society. https://doi.org/10.1016/j.techsoc.2017.09.006.
Hossain, M., 2021. Frugal innovation and sustainable business models. Technol. Soc. 64, 101508.
Howell, R., van Beers, C., Doorn, N., 2018. Value capture and value creation: the role of information technology in business models for frugal innovations in Africa. Technol. Forecast. Soc. Change 131, 227–239.
Khanna, T., Palepu, K.G., Sinha, J., 2005. Strategies that fit emerging markets. Harv. Bus. Rev. 83 (6), 1–18. Retrieved from. https://hbr.org/2005/06/strategies-that-fit-emerging-markets.
Kindström, D., 2010. Towards a service-based business model – key aspects for future competitive advantage. Eur. Manag. J. 28, 479–490.
Kolk, A., Rivera-Santos, M., Ruffín, C., 2014. Reviewing a decade of research on the "base/bottom of the pyramid" (BOP) concept. Bus. Soc. 53, 338–377.
Kroeger, A., Weber, C., 2014. Developing a conceptual framework for comparing social value creation. Acad. Manag. Rev. 39, 513–540.
Kroll, H., Gabriel, M., 2020. Frugal innovation in, by and for Europe. Int. J. Technol. Manag. 83, 34–54.
Leliveld, A., Knorringa, P., 2018. Frugal innovation and development research. Eur. J. Dev. Res. 30, 1–16.

Lepak, D.P., Smith, K.G., Taylor, M.S., 2007. Value creation and value capture: a multilevel perspective. Acad. Manag. Rev. 32, 180–194.
Levänen, J., Hossain, M., Wierenga, M., 2022. Frugal innovation in the midst of societal and operational pressures. J. Clean. Prod. 347, 131308.
Liu, Y., Wei, J., 2018. Frugal innovation in resource-constrained emerging markets. Acad. Manag. Proc. 2018, 11629.
Massa, L., Tucci, C.L., Afuah, A., 2017. A critical assessment of business model research. Acad. Manag. Ann. 11, 73–104.
Onsongo, E., 2017. Institutional entrepreneurship and social innovation at the base of the pyramid: the case of M-Pesa in Kenya. Ind. Innovat. 1–22.
Onsongo, E., Knorringa, P., 2020. Comparing Frugality and Inclusion in Innovation for Development: Logic, Process and Outcome. Innovation and Development, pp. 1–21.
Oskam, I., Bossink, B., de Man, A.-P., 2018. The interaction between network ties and business modeling: case studies of sustainability-oriented innovations. J. Clean. Prod. 177, 555–566.
Oskam, I., Bossink, B., de Man, A.-P., 2021. Valuing value in innovation ecosystems: how cross-sector actors overcome tensions in collaborative sustainable business model development. Bus. Soc. 60, 1059–1091.
Osterwalder, A., Pigneur, Y., 2010. Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers. John Wiley & Sons.
Pateli, A.G., Giaglis, G.M., 2005. Technology innovation-induced business model change: a contingency approach. J. Organ. Change Manag. 18, 167–183.
Pisoni, A., Michelin, L., Martignoni, G., 2018. Frugal approach to innovation: state of the art and future perspectives. J. Clean. Prod. 171, 107–126.
Pitelis, C.N., 2009. The Co-evolution of organizational value capture, value creation and sustainable advantage. Organ. Stud. 30, 1115–1139.
Prahalad, C.K., Hammond, A., 2002. Serving the world's poor, profitably. Harv. Bus. Rev. 80, 48–57.
Priem, R.L., 2007. A Consumer Perspective on Value Creation. Acad. Manag. Rev. 32, 219–235.
Radjou, N., Prabhu, J., 2014, December 10. What Frugal Innovators Do. Retrieved October 24, 2017, from Harvard Business Review website. https://hbr.org/2014/12/what-frugal-innovators-do.
Ramdorai, A., Herstatt, C., 2015. Frugal Innovation in Healthcare: How Targeting Low-Income Markets Leads to Disruptive Innovation, 2015 edition. Springer, Switzerland.
Rao, B.C., 2013. How disruptive is frugal? Technol. Soc. 35, 65–73.
Ritala, P., Agouridas, V., Assimakopoulos, D., Gies, O., 2013. Value creation and capture mechanisms in innovation ecosystems: a comparative case study. Int. J. Technol. Manag. 63, 244.
Rocchi, S., Bahaa, E.S., Subbaraman, K., de Clerck, L., Brand, R., 2018. Turning societal challenges into business through value sharing. Eur. Bus. Rev. 5–12. Retrieved from. http://www.europeanbusinessreview.com/turning-societal-challenges-into-business-through-value-sharing/.
Rosca, E., Arnold, M., Bendul, J.C., 2016. Business models for sustainable innovation – an empirical analysis of frugal products and services. J. Clean. Prod. https://doi.org/10.1016/j.jclepro.2016.02.050.
Sachs, et al., 2021. The Decade of Action for the Sustainable Development Goals. Sustainable Development Report 2021. Cambridge University Press, Cambridge.
Saebi, T., Lien, L., Foss, N.J., 2017. What drives business model adaptation? The impact of opportunities, threats and strategic orientation. Long. Range Plan. 50, 567–581.
Saldaña, J., 2003. *Longitudinal Qualitative Research: Analyzing Change Through Time*. Press, Walnut Creek, Calif: AltaMira.
Sarkar, S., Mateus, S., 2022a. Doing more with less—how frugal innovations can contribute to improving healthcare systems. Soc. Sci. Med. 306, 115127.
Sarkar, S., Mateus, S., 2022b. Value creation using minimal resources – a meta-synthesis of frugal innovation. Technol. Forecast. Soc. Change 179, 121612.
Sehgal, V., Dehoff, K., Panneer, G., 2010. The Importance of Frugal Engineering. Retrieved 21 September 2016, from Strategy+business website: http://www.strategy-business.com/article/10201?gko=24674.
Shafer, S.M., Smith, H.J., Linder, J.C., 2005. The power of business models. Bus. Horiz. 48, 199–207.
Sinkovics, N., Sinkovics, R.R., Yamin, M., 2014. The role of social value creation in business model formulation at the bottom of the pyramid – implications for MNEs? Int. Bus. Rev. 23, 692–707.
Soni, P., Krishnan, R.T., 2014. Frugal innovation: aligning theory, practice, and public policy. Journal of Indian Business Research 6, 29–47.
Sosna, M., Trevinyo-Rodríguez, R.N., Velamuri, S.R., 2010. Business model innovation through trial-and-error learning: the naturhouse case. Long. Range Plan. 43, 383–407.
Soumaya, B.L., 2014. The uneasy transition from supply chains to ecosystems: the value-creation/value-capture dilemma. Manag. Decis. 52, 278–295.
Teece, D.J., 2010. Business models, business strategy and innovation. Long. Range Plan. 43, 172–194.
Tiwari, R., Kalogerakis, K., Herstatt, C., 2014. Frugal Innovation and Analogies: Some Propositions for Product Development in Emerging Economies. https://doi.org/10.15480/882.1173.
United Nations, 2015. *Transforming Our World: The 2030 Agenda for Sustainable Development*. UN Publishing, New York.
Vega, G., Kidwell, R.E., 2007. Toward a typology of new venture creators: Similarities and contrasts between business and social entrepreneurs. N. Engl. J. Enterpren. 10, 15–28.
Visnjic, I., Wiengarten, F., Neely, A., 2016. Only the Brave: Product Innovation, Service Business Model Innovation, and Their Impact on Performance. J. Prod. Innovat. Manag. 33, 36–52.
Winterhalter, S., Zeschky, M.B., Neumann, L., Gassmann, O., 2017. Business models for frugal innovation in emerging markets: the case of the medical device and laboratory equipment industry. Technovation. https://doi.org/10.1016/j.technovation.2017.07.002.
Wirtz, B.W., Pistoia, A., Ullrich, S., Göttel, V., 2016. Business models: origin, development and future research perspectives. Long. Range Plan. 49, 36–54.
Yin, R.K., 2009. Case Study Research: Design and Methods. Sage Publications.
Zeschky, M.B., Winterhalter, S., Gassmann, O., 2014. From cost to frugal and reverse innovation: mapping the field and implications for global competitiveness. Res. Technol. Manag. 57, 20–27.
Zott, C., Amit, R., 2010. Business model design: an activity system perspective. Long. Range Plan. 43, 216–226.
Zott, C., Amit, R., 2013. The business model: a theoretically anchored robust construct for strategic analysis. Strat. Organ. 11, 403–411.
Zott, C., Amit, R., Massa, L., 2011. The business model: recent developments and future research. J. Manag. 37, 1019–1042.