Enabling and Managing Resource-constrained Innovation: Strategic Organization, Value Creation and Capacity Building

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St. Gallen, April, 2019 Lukas Neumann

Abstract

Over the past 20 years, the global economic landscape has shifted from traditional Western markets towards emerging and developing countries. Markets that started out as extended workbench of Western firms (China, India and gradually African countries) are increasingly consuming, producing and driving innovation. Through their economic development, a thriving middle-class has developed in these markets, which is now one of the major growth drivers of the global economy. Nevertheless, these markets still face many difficulties such as lower disposable incomes, institutional voids or inadequate infrastructure. Therefore, firms that want to serve and capture these growing segments as their customer base need to adapt their products, services as well as their activities along their value creation to succeed. This development has brought forth the so-called resource-constrained innovation. A phenomenon that has more and more caught the attention of academic research in recent years. Unfortunately, many of the early publications build their argumentation around few recurring cases that tend to be reported in a rather anecdotal manner. Additionally, the field is still very much concerned with theoretical discussions and conceptualization. Consequently, many questions surrounding this phenomenon remain unanswered: How can firms enable and mange resource-constrained innovation? How are markets selected? How are current business practices changing? What mindset is required to succeed? Overall, a systematic and empirical approach is needed to progress in this field. Hence, the four independent research papers in this thesis address some of these questions to fill gaps in the literature. This thesis starts with an introductory chapter that gives an overview on the overall research and background. The first paper investigates the implications of market choice and disruption. The second article studies the successful transfer of knowledge along various value chain actives. In paper three, the role of autonomy as a management tool in the context of strategic dualities (serving high-, middle- and low-income segment in parallel) is investigated. In the last paper, it is shown how Western MNCs adapt their value chain activities to capture resource-constrained customers. Generally, this doctoral thesis offers new and in-depth insights into a highly relevant and growing field of innovation for resource-constrained customers in emerging and developing markets. The presented papers are amongst the first to adapt an empirically-backed and more comprehensive perspective on innovation that target new customer and market segments. Through this evidence, is provided on how firms can achieve such innovations, how they have to organize, and what capabilities are necessary to succeed in new as well as global markets.

Kurzdarstellung

In den letzten 20 Jahren hat sich der globale ökonomische Fokus von traditionellen westlichen Märkten zunehmend hin zu Schwellen- und Entwicklungsländern verschoben. Länder wie China, Indien aber auch vermehrt afrikanische Länder entwickeln sich mit steigender Tendenz von reinen Produktionsstandorten hin zu Märkten, die verstärkt Innovationen hervorbringen und konsumieren. Diese Entwicklung ist vor allem durch die wachsende Mittelschicht in diesen Märkten getrieben, die zunehmend die globale Konsumlandschaft beeinflusst. Jedoch weichen Umfeld und Kundenbedürfnisse in diesen Einkommenssegmenten und Märkten signifikant von bisher Bekanntem ab (z.B. geringeres Einkommen, inexistente Infrastruktur oder fehlende öffentliche Institutionen). Dies erfordert von Firmen, dass sie sowohl Ihre Produkte und Dienstleistungen aber auch ihre Aktivitäten entlang der Wertschöpfung diesen Umständen anpassen, um diese neuen Kunden erfolgreich für sich zu gewinnen. In den letzten Jahren hat auch die Forschung diese Entwicklung aufgegriffen und hierzu diverse Fallbeispiele beschrieben. Dies ist jedoch vornehmlich in einer anekdotenhaften Art und Weise geschehen und weniger mit wissenschaftlich fundierten empirischen Studien. Dieses Vorgehen hat dazu geführt, dass immer noch unzählige offene Fragestellungen existieren: Wie entwickelt man für ‘Nicht-Kunden’? Wie wird Wissen transferiert? Wie muss die Wertschöpfung anpasst werden? Welche Strategien brauche werden benötigt? Um einige dieser Forschungslücken zu schliessen, präsentiert diese Dissertation eine Einleitung zum Hintergrund und der aktuellen Forschung, vier unabhängige Publikationen und einen Ausblick. In der ersten Publikation werden die Auswirkungen der Wahl des Zielmarktes und die Rolle von Disruptionen im Kontext von Schwellen- und Entwicklungsländern untersucht. In der zweiten Publikation, geht es um den korrekten Transfer von Wissen entlang verschiedener Phasen der Wertschöpfung von Firmen, die frugale Innovationen für neue Kundensegmente entwickelt haben. Der dritte Artikel erforscht die Rolle von Autonomie als Werkzeug für Unternehmen, die parallel Kunden in oberen, mittleren und unteren Einkommensschichten in verschiedenen geographischen Märkten bedienen (strategische Dualität). Im vierten Artikel werden die Veränderungen der Wertschöpfungsaktivitäten multinationaler Unternehmen in diesem Kontext beleuchtet. Zum Abschluss wird ein Ausblick mit Implikationen für die weiterführende Forschung und Erkenntnisse für Praktiker beschrieben. Die Artikel, die in dieser Dissertation präsentiert werden, zählen zu den ersten Arbeiten, die einen systematischen und empirischen Blick auf die beschriebenen Phänomene werfen. Dies zielt darauf ab, einen Erkenntnisgewinn für Wissenschaft und Praxis zu schaffen.

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List of abbreviations

BoP	Base / Bottom of the pyramid
B2B	Business-to-business
B2C	Business-to-customer
BRIC	Brazil, Russia, India and China
BRIICS	Brazil, Russia, India, Indonesia, China and South Africa
CI	Cost Innovation
DM	Developed market
e.g.	For example
EM	Emerging market
FI	Frugal Innovation
GI	Good-enough Innovation
HQ	Headquarter
i.e.	That is
MNC	Multinational companies
MNE	Multinational entreprise
RCI	Resource-constrained innovation
RI	Reverse Innovation

1. Goal of this thesis, research question & introduction

1.1 Main research question

This doctoral dissertation adds to the discussion in the academic literature on innovation for emerging and developing markets, resource-constrained innovation, customers, international business as well as strategy research. The insights presented here intent to create a better understanding of successful practices, which span all activities of firms that aim to capture new customer and market segments with resource-constrained innovations, specifically in emerging and developing markets. The research questions presented here revolve around disruption, market choice, knowledge transfer, strategic dualities and autonomy as well as value chain adaptations. As the literature review indicates, the fields of research addressed in this thesis are flourishing but still offers various untouched yet promising research avenues. Therefore, the overall objective of this thesis is to provide new insights and offer stimulating contributions to the aforementioned fields. The findings presented here are meant for academics as wells as practitioners. The general research question of this thesis is as follows:

Research question: *How can (Western) companies manage resource-constrained innovation to capture new customer segments in emerging and developing markets?*

This rather broad research question was divided into sub-questions, which are presented in four independent research papers. The first two papers take a market perspective to study disruption, the consequences of market choice and the transfer of knowledge. The other two papers take a product perspective to investigate the role of autonomy in managing strategic dualities and value chains. In the following, each of the sub-questions will be presented. An overview of all papers can be found in Table 1 including the title, publication status, authors, methods, data and main findings.

1.2 Sub-questions

Paper A: What are the consequences and implications of market choice?

Paper B: What are the processes and structures enabling knowledge transfer in the context of Frugal Innovation?

Paper C: What is the role of autonomy in managing strategic dualities in the context of resource-constrained innovation?

Paper D: How do Western MNCs adapt their value chain activities to capture resource-constrained customers?

Table 1: Overview of research papers

P	Title	Authors	Method and data	Overview findings
P1	Market maketh Magic - Consequences and Implications of Market Choice for Frugal Innovation *Accepted for publication in Int. J. Technology Management*	Neumann, L., Winterhalter, S. & Gassmann, O.	Mixed-method (237 cases off Frugal Innovation)	• Insights regarding implications and consequences of market choice for Frugal Innovation • Introduction of four distinct clusters to understand the phenomenon from a new perspective • All cases investigated in this study create either low-end disruption or new market disruption
P2	Knowledge Transfer in the Context of Frugal Innovation *Published in Int. J. Technology Transfer and Commercialisation*	Neumann, L., Böhm, J. & Wecht, H. C.	Qualitative (11 cases; Western Start-ups, SMEs & MNCs)	• Knowledge transfer in the context of Frugal Innovation is studied • Two clusters ('Active' and 'Non-active' were identified indicating a varying degree of influx and outflow of knowledge transfer • Three distinct phases along the value creation process
P3	Managing Strategic Dualities: The Allocation of Autonomy in Western MNCs innovating for Resource-constrained Customers	Neumann L., Vincent, J. Winterhalter, S. & Gassmann, O.	Qualitative (12 cases; Western MNCs)	• The role and allocation of autonomy as a tool to manage strategic duality is explored looking at Western MNCs that innovate for resource-constrained customers • A first differentiation of strategic and operational autonomy in this context is introduced • Role of headquarters and subsidiaries in resource-constrained innovation initiatives
P4	Capturing Resource-constrained Customer Segments: How Western MNCs adapt Value Chains to succeed in Emerging Markets	Neumann, L.	Qualitative (18 cases; Western MNCs)	• Adaptations to value chain activities in Western MNCs aiming to capture resource-constrained customers • The study identfies three different clusters that are differentiated by the degree of product innovation, the extend of value chain adaption and the degree of localization.

1.3 Structure of the thesis

The following figure displays the structure of this doctoral thesis.

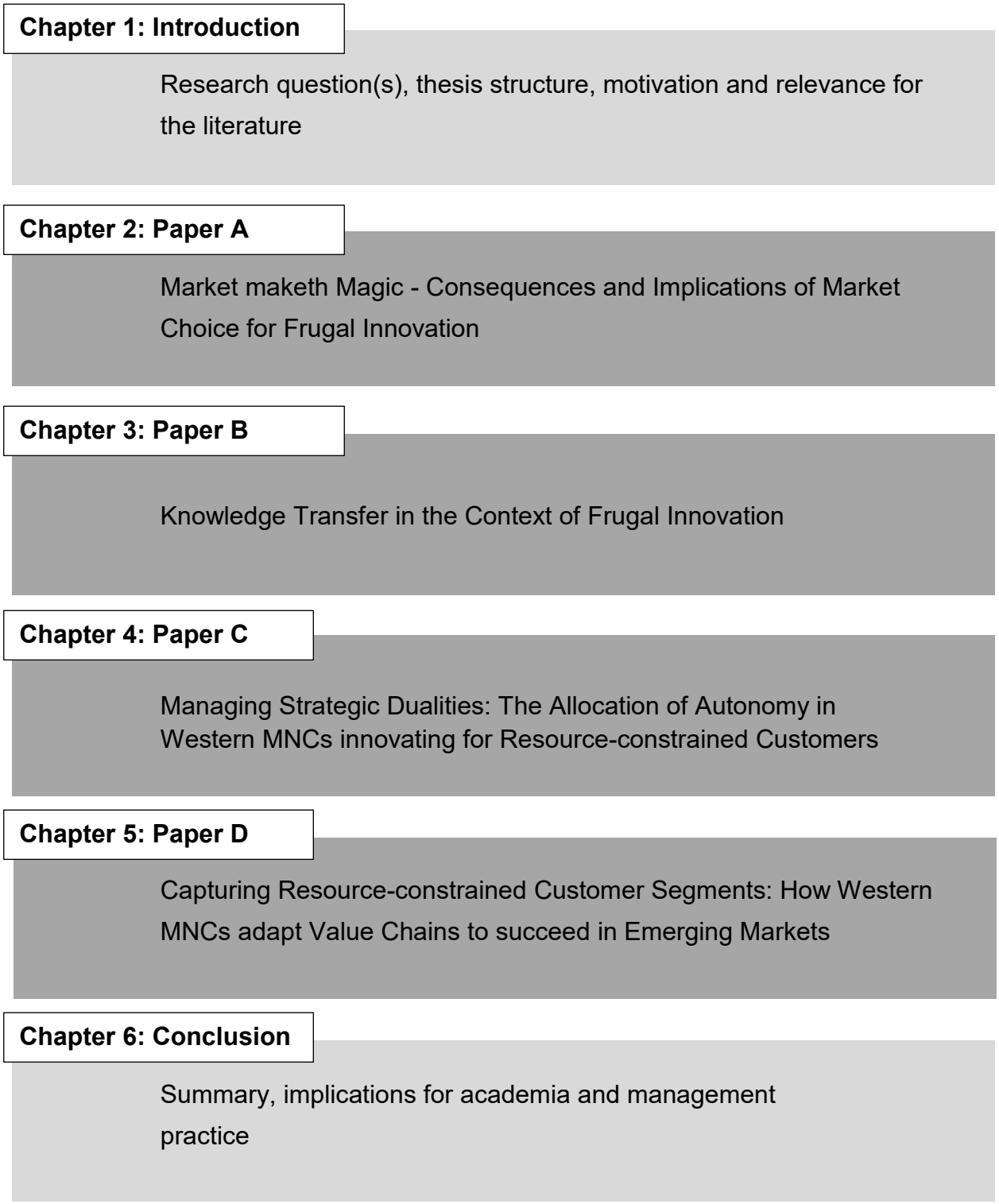

Figure 1: Overview thesis structure

1.4 A shift of power towards emerging and developing markets[1]

1.4.1 Motivation and relevance

Over the past years, innovation activities in and for emerging and developing markets has gained a prominent role in the academic discourse, as it oftentimes breaks with existing innovation paradigms. These products and services are driven by the intention of serving customers in resource-constrained contexts at the BoP and in the emerging middle class (Prabhu & Jain, 2015; Prahalad, 2010). Another driving factor is the recognition that products and services originally developed for Western markets are not able to deliver high value at low costs to consumers in these economies (London & Hart, 2004). Products favored by customers in these markets are distinctly different from those preferred in developed economies, given the lower income levels and the vastly different context. From this, a new category of 'low-cost' innovation emerged - the so-called resource-constrained innovation (RCI) (Ray & Ray, 2010). As this concept is rather novel, varying terms are used interchangeably by practitioners and in the literature. Common terms are 'Cost Innovation' (Williamson & Zeng, 2009; Williamson, 2010), 'Good-enough Innovation' (Gadiesh et al., 2007; Hart & Christensen, 2002) 'Frugal Innovation' (Cunha et al., 2014; Zeschky et al., 2011; Cappelli et al., 2010) or 'Reverse Innovation' (von Zedtwitz et al., 2014; Govindarajan, 2012; Immelt et al., 2009). Other terms in use are Jugaad (Sharma & Iyer, 2012) Gandhian innovation (Prahalad & Mashelkar, 2010), Trickle up (Reena, 2009) and Shanzhai (Hu et al., 2011; Zhu & Shi, 2010). However, the latter terms often denote non-corporate bottom-up solutions by individual inventors. Nevertheless, the major difference of these innovation types compared to their Western counterparts is the fact that they specifically target resource-constrained customers with little excess incomes but an urgent need for appropriate solutions in e.g. healthcare, energy supply or information technology. Concerning the research in the context of my thesis, I adopt the terminology that is defined and classified in Zeschky et al. (2014). Here, a distinction is being made between Cost Innovation (cost reductions achieved through process innovation; 'same for less'), Good-enough Innovation (process innovation plus adapted features tailored to the specific context; 'tailored for less') and Frugal Innovation (specifically developed solutions for RCI customers; 'new for less'). And lastly, all of the latter can become Reverse Innovations ('elsewhere'), if they are repatriated into developed markets. This fine-grained perspective on resource-

[1] Some parts of the introduction have been presented in a similar format in the successful application for the SNF 'DocMobility' stipend P1SGP1_178411

constrained innovation allows for a much more thorough and differentiated exploration of this theme and consequently more accurate findings for literature and practice. Currently, most Western and multi-nationally operating firms are targeting customers (B2B & B2C), which are classified as the Upper class (Figure 2). Products and services that are offered in this segment are sold around the globe with minor or not adaptations regardless of the target market. This is mainly due to the homogeneity within this segment (Prahalad, 2002). So far, this segment has powered and guided the global economy, as all innovations were tailored to fit the needs of these customers in their respective context. These innovations are characterized by the highest level of technological sophistication, high prices and extensive functionality. As firms serving this segment stand in fierce competition in many cases, the phenomenon of over-engineering frequently occurs. This means that the innovation at hand offer a level of technology and functionalities that often surpasses the expectations and needs of the targeted customer. This development is starkly driven by the firms' focus on beating the competitors' level of innovation rather than satisfying the core needs of their customer. One of the downsides of this development is that a growing amount of firms end up in technology niches, which are specialized to a degree that does not allows for much more productive innovation and consequently limits the accessible customer base. Further, this approach to innovation is very resource-intense and strains the globally available resource base. Thus, in order for firms to grow in the future, they must move into the middle-class segment and even below that. To succeed in these much larger market segments with a different need base and market contexts, especially Western and high-tech firms must change and adapt their activities to stand a chance. An additional effect of firms moving into these lower and middle-income segments is the increase in life quality for people in these economic segments, which in the end advance towards the top of the pyramid. Resource-constrained innovations itself are just the outcome of a process, for research the interesting part is how firms actually get there and what is required in terms of change and how this is enabled and managed. Overall, research dealing with resource-constrained innovation is a relatively novel and aspiring field, which has attracted a lot of attention in the literature, primarily in practitioner-oriented outlets. Management research only recently started the discussion on the phenomenon. As this field is still progressing, connections to almost all current discussion need to be made in order to fully explore the phenomenon and its contribution to on-going discussions. The purpose of this thesis is to clarify and broaden the discussion around resource-constrained innovation by adding to theories, conceptualizations as well as practices in management.

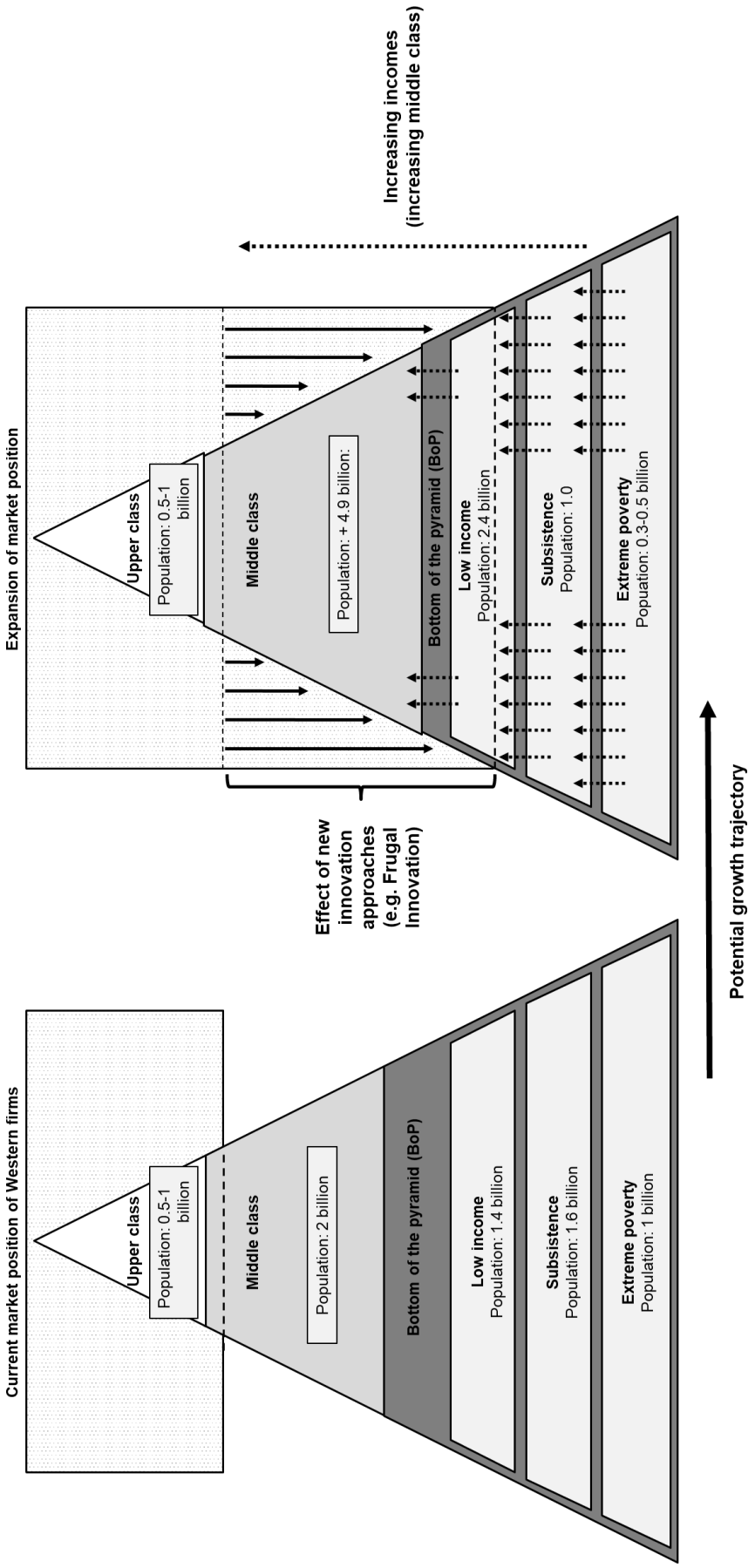

Figure 2: Current market position and potential growth trajectory (Source: United Nations, 2015)

1.5 State of the art in research

1.5.1 Innovation in and for emerging and developing markets

About twenty years ago, the topic of emerging markets was picked up by the 'International Business' literature with a strong focus on the BRIC (Brazil, Russia, India & China) or the updated BRIICS (Brazil, Russia, India, Indonesia, China & South Africa) countries (Ricart et al., 2004). Traditionally, the focus was on approaches of existing products and business practices that were rolled-out on a global scale and increasingly in emerging markets. However, in these markets only the affluent market segments at the very top of the economic pyramid were targeted, even though they only represent a small proportion of the entire market potential in these economies (Arnold & Quelch, 1998; London & Hart, 2004; Prahalad & Lieberthal, 1998). Subsequently, based on Prahalad's groundbreaking work about the bottom-of-the-pyramid, scholars started to explore how companies can serve the emerging middle-class and the poor, while simultaneously improving their lives (Prahalad & Hammond, 2002). Yet, entering these markets is highly challenging for firms planning to serve these new segments (Burgees & Steenkamp, 2006; Luo, 2001; Peng et al., 2008; Wright et al., 2005). Institutional voids (Khanna & Palepu, 2005) and insufficient infrastructure including roads, sanitation, or electricity (Ricart et al., 2004) create numerous constraints that both the firms and the customers have to deal with (Hoskission et al, 2013). Additionally, cultural conditions deviate from what Western firms are used to, especially in rural areas, which makes operating in these environments highly demanding (Anderson & Markides, 2007). For the discussion in the field of international business, this development opened up many new directions for research. Scholars aim to understand the internationalization processes (Brown & Hagel, 2005), location advantages for knowledge transfer (Alcácer & Chung, 2011a, 2011b), off-shoring (Kenney et al., 2009), competitive advantages (Nobel & Birkinshaw, 1998), transfer of firm activities (e.g. R&D or Marketing) (Athreye et al., 2014), and intellectual property protection strategies (Keupp et al., 2008). Another area of inquiry that has recently developed is the fact that emerging market MNCs internationalize different in comparison to Western firms. Insights into this observation have the potential to enhance and broaden internationalization theories (Buckley & Hashai, 2014; Moghaddam et al., 2014). Moreover, the phenomena of Reverse Innovation raises questions that existing theories simply cannot answer at their current stage (von Zedtwitz et al., 2014). While earlier publications have made important contributions to this new research stream, a major drawback is the inherent focus on conceptualizations and definitions based on relatively few reoccurring examples that

are in many cases rather anecdotal than empirical. Further, insights in strategic, structural, process, and capability related premises that enable RCI are mostly absent (e.g. Brown & Hagel, 2005; Hang et al. 2010; Immelt et al. 2009). Overall, research on emerging markets entails various facets that can add to an improvement and a better understanding of existing theories as well as the creation of new theory. Exploring the impact and consequences for established theories, taking this fine-grained perspective could potentially reveal many new areas of inquiry.

1.5.2 Resource-constrained innovation (RCI)

Nowadays, Western enterprises realize increasingly that they need to adjust their approaches and business models to reach five billion prospective customers that represent the base of the pyramid (Wright et al., 2005). For multinational companies to enter these competitive markets it vital to specifically address the needs of these new potential consumers. Therefore, firms all around the globe have started to develop innovations that explicitly cater to the requirements of such people. These solutions have caught significant attention from managers and scholars alike and can generally be summarized under the umbrella term ‘resource-constrained innovation’. Prominent examples of such product are low-cost cars (Lim et al., 2013), medical devices (Zeschky, et al., 2014), home appliances (Hand et al., 2010), energy devices (Tan & Mathews, 2015) or low-cost consumer products (Kaur, 20013). Generally, resource-constraint innovation can be divided into four categories: ‘Cost Innovation’, ‘Good-enough Innovation’, ‘Frugal Innovation’ and ‘Reverse Innovation’. Whereas, Reverse Innovation are simple any kind of the previous three that were conceptualized for an emerging market and are transferred into a developed country afterwards (Von Zedtwitz et al., 2015). A more detailed description of the other three can be found below.

Cost Innovation (CI)

Cost Innovation as solutions offer similar or identical functionalities as their Western counterparts, however at significantly lower cost. The target group are mainly resource-constrained customers but are not limited to it. These innovations can also attract more affluent customers looking for cheaper solutions (Williamson, 2010). As a concept itself, Cost Innovation is not new. Numerous cases exists in which low-cost competitors drastically reduced costs and consequently turned expensive Western goods into commodities. The revival of Cost Innovations was substantially driven by firms based in China and India. Here, the main trigger was the economical situations

in emerging markets. These companies were able to realize huge cost reductions in their R&D and production processes by taking advantage of low labor costs, cheaper local raw material sourcing, more standardized components and economies of scale. Additionally, to the lower price point firms often develop innovative and disruptive business models (Prahalad, 2010). Therefore, Cost Innovations are enabled mainly by process innovations that result in a reduction on operational costs. Since, most Cost Innovations are made from of existing and available components, the key success factor lies in the process capabilities, such as production in low-cost markets (Williamson & Zeng, 2009). Western player that opt for this approach can use Cost Innovation to expand their markets and even tap niche markets. Especially, solutions from Western brands that offer the same functionality at lower cost appeal to financially constrained customers thus making them first-time customers in many cases.

Good-enough Innovation (GI)

Good-enough Innovation aim to meet a range of functionalities and features that go beyond financial limitations, specifically designed for resource-constrained customers (Zeschky et al., 2011). This approach requires an adaption and re-engineering of the product to fit the particular requirements of low-income markets in addition to the low price point. Many customers seek only basic functionalities without frills. Therefore, firms need to focus of fewer features, low operating costs and particularly user-friendliness and core functions. The low price-point is achieved by such measures as e.g. cheaper materials for non-essential parts and radically reduced packaging to save cost. When it comes to Good-enough Innovation the biggest challenge is to identify the core functions that are perceived as value-adding and to eliminate those that do not deliver value to the target customer. Additionally, successful solution incorporate some kind of product novelty that is created through the focus on core functions and features. Examples are increased user-friendliness or higher robustness. All this needs to result in a custom-tailored and low-cost product for the needs of emerging markets. Especially, companies from emerging markets itself are at home in this domain. They know exactly what their price-sensitive customer requires and what features are perceived as superfluous. Yet, Western firms are increasingly developing good-enough solutions for this growing market segment.

Frugal Innovation (FI)

Frugal Innovation as a term has been widely used to describe innovations that are specifically developed for resource-constrained customers, particularly in the context of emerging markets (Zeschky et al., 2011; Sharma & Iyer, 2012). Lately, this focus expanded as these innovations are gaining increasing attention and relevance in developed markets as well. Frugal Innovation, opposed to Good-enough Innovations, are not only re-engineered solutions of their Western counterparts (Rao, 2013; Sinha, 2013). They are rather products or services with a new type of value architecture, which is specifically developed for an entirely new application in a resource-constraint context at a much lower price point (Immelt et al., 2009, Winterhalter et al., 2017). They respond to limitations in resources such as financial, institutional or material with a more efficient use of these in development, production and distribution. Frugal Innovation are from both a technology and a market perspective relatively novel and are often disruptive to their market environment. The fact that a product transforms from e.g. stationary to portable potentially enables Frugal Innovations to reach entirely new customer groups (Cunha et al., 2014; Gassmann et al., 2017). These type of solutions are grounded in the drive to fulfill basic requirements at the lowest cost, to extend existing markets and to create or enter new markets (Sinha, 2013; Winterhalter et al., 2014). Yet, Frugal Innovations aim at making better not cheaper things, extend the value proposition beyond the traditional product. Consequently, they are about new solutions and not just de-featuring and lastly are not exclusively low-cost but can require or entail solutions at the frontier of science and technology.

In general, research on resource-constrained and emerging markets provides countless aspects that can improve the current explanation of established theories and additionally create new theoretically contributions or research streams. The research presented in this thesis adds to the existing body of literature by showing how firms manage and organize for these innovations. It shows how global activities are adapted and illustrates the effect of resource-constrained innovation in their target market. Further, first indications are offered regarding the effect this type of innovation has on traditional innovation activities and the potential of addressing customers in traditional segments as well.

2. Paper A: Market maketh Magic - Consequences and Implications of Market Choice for Frugal Innovation

Co-authored by Stephan Winterhalter and Oliver Gassmann

Accepted in International Journal of Technology Management

Abstract

This study systematically analyzed 237 cases of Frugal Innovation cases in order to understand the consequences and implications of market choice on the characteristics of a successful Frugal Innovation. The results demonstrate that this type of innovation is always disruptive to its target market. Further, the study shows that firms tend to focus either on activities along the value chain or the solution (product and service) itself. This distinction yielded four clusters of Frugal Innovation, which are described in detail including aspects regarding strategy, organization, processes and technology.

Keywords: Frugal Innovation, resource-constrained innovation, emerging markets, developing markets, bottom of the pyramid, emerging middle class, disruption, low-end disruption, new market disruption

2.1 Introduction

Drawing on an old English proverb, William Horman once wrote, ‘Manners maketh man’ (Vulgaria uiri doctissimi, 1519), implying that the essence of men is defined by manners. Undoubting, one could argue a similar tie exists between firms and innovation. With this in mind, our article sets out to investigate the consequences and implications of market choice in the context of Frugal Innovation. The starting point of this investigation is profit driven by growth and expansion, which can be seen as the motivating factor behind the vast majority of business activities around the world. Therefore, firms across all industries are investing substantial resources into creating and sustaining continuous growth with their products, services and business models. This includes technological advances of products, the development of unique services, novel revenue models and much more. In order to succeed with these activities it is vital to study und understand the driving forces behind growth, such as the customer and the market environment, closely. Overall, companies tend to regard their existing customers as the critical information source for the conception of new solutions and offerings in order to grow profitably. Until recently, mostly people in Western markets or high-income segments fueled the global economic growth and by this shaped products and services. This leaves many people around the globe in an almost vacuum-like state when it comes to active participation in the formal economy (Hart & Christensen, 2002). However, many of the industrialized markets experienced and experience financial crises and recessions, resulting in stagnating incomes and increasing unemployment rates. This is particularly the case for their middle classes, which represent the economical backbone in most of these countries. Simultaneously, the global community has to deal with an ever-growing world population, forcing all of us to think of ways to reduce resource consumption and reconsider our approach to innovation (Brem & Ivens, 2013). As the global economic situation is changing drastically, new markets are gravitating towards the center of attention when it comes to growth opportunities. Already today, emerging and developing markets represent 70% of the global economic growth (IMF, 2016). By now, politics, industry and academia have widely recognized the (mostly untapped) potential of emerging and developing markets and the economic growth prospects connected to them (Prabhu et al., 2017). Many countries in Asia, Africa and Latin America develop rapidly and consequently offer new markets and growth opportunities for local and international companies. Recent years have seen an increased interest and attention among practitioners and in the scientific discourse on innovations that explicitly target market and customer segments in emerging and developing markets. One increasingly

growing stream in this field is the debate around Frugal Innovation. Initially, this term described specifically (re)designed products, services or systems that explicitly cater to the needs of resource-constrained customers in underserved market segments, such as the so-called bottom of the pyramid (BoP) or the emerging middle class (Prahalad & Hammond, 2002; Prahaldad, 2012), across emerging and developing countries (Prabhu & Jain, 2015; Winterhalter et al., 2017; Zeschky et al., 2014). From a technology and market perspective, Frugal Innovations reportedly are fairly novel and based on a new product architecture that is build with existing technology enabling new applications at a significantly lower price (Lehner & Gausemeier, 2016; Rego, 2014). After advancing quite substantially in Southeast Asia, China, India, Africa and Latin America, Frugal Innovation are increasingly finding their way into Western, industrialized markets. So far, the academic debate among scholars mostly focused on definitions and conceptual aspects of Frugal Innovation (Brem & Wolfram 2014; Soni & Krishnan 2014; Ray & Ray, 2010; Zeschky et al., 2011) even though the field is branching out to some extent. Overall, available cases show that Frugal Innovation can take varying forms and cover a great bandwidth of customer segments, which are not restricted to specific market environments. Scholars argue that innovations, which target resource-constrained customers, particularly Frugal Innovation, are quite disruptive to the market environment they are introduced to (Wan et al., 2015). These distinctive forms of resource-constrained innovations are associated with a disruptive character (Zeschky et al., 2014), as they have the potential to reach BoP customers through significantly reducing the initial purchasing and or total ownership costs. Simultaneously, these innovations provide a solution that utilizes as few resources as possible to create the ideal fit to the intended purpose whilst taking the local conditions into consideration. In combination with additional functionalities, they can even create entirely new-markets (Agarwal & Brem 2012, Prahalad, 2012, Rao, 2013, Zeschky, et al. 2014). Due to all these factors, an increasing number of firms as well as academics want to understand how Frugal Innovation can be realized successfully. One central theme that continuously occurs in the discussions around and in publications dealing with Frugal Innovation is the market environment in emerging and developing countries itself. In many cases, they have been described as highly demanding to operate in and cater to, especially for Western firms, who have almost no preliminary experience with them (Anderson & Markides, 2007; London & Hart, 2004). In order to realize Frugal Innovations successfully, knowledge of the target market that oftentimes shapes the customers' needs is essential (Zeschky et al., 2014; Williamson, 2010). Due to their inherent properties, emerging and developing markets create numerous

constraints, such as institutional voids (Khanna & Palepu, 1997; 2000) or the absence or adequate infrastructure, be it electricity, water supply, sanitation, roads and other aspects (Ricart et al., 2004). Both firms and customers have to deal with these constraints (Hoskission et al., 2013) and consequently the innovation itself needs to overcome these obstacles successfully. This area seems to be a particular promising field due to the heterogeneity and novelty of the target segments of Frugal Innovation (Winterhalter et al., 2017). Further, many authors concentrate solely on the product or service perspective (Brem & Wolfram, 2014). Thus far, research has not investigated the consequences and implications of market choice in the context of Frugal Innovation. Therefore, this study will investigate the interplay between target market and the solution as it seems apparent that firms as well as scholars need to understand this critical interaction. From this, we will generate new insights that contribute to a deeper understanding of Frugal Innovation in academia and among practitioners. In the following, the research method is introduced, the findings are presented and implications as well as consequences are discussed in the context of current debates within the literature.

2.2 Method

2.2.1 Data collection

As this publication investigates a new premise, the selected research approach was of exploratory nature. Consequently, this study is based on a multi-case study approach (cross-industry and cross-national), which allows for in-depth research. This method is especially appropriate for the examination of novel research topics and contemporary phenomena as it allows to answer ‘how’ and ‘why’ questions (Yin, 2014; Eisenhardt, 1989). Before we started our analysis, extant literature regarding the topic under investigation was studied to generate a comprehensive research guide including an extensive questionnaire. Overall, our empirical analysis took place in three differentiated phases. First, our investigation commenced with the collection of 33 unique in-depth case studies spanning various industries and target markets (see Table 2; Figure 3: underlined case numbers; Appendix 3-6 underlined case numbers). The case studies were selected based on their fit to established definitions and descriptions in the literature concerning Frugal Innovation (see Weyrauch & Herstatt, 2014; Zeschky et al., 2014; Winterhalter et al. 2017). These cases are based on primary data, which was collected in form of 57 interviews, which lasted between 45 – 90 minutes (either face-to-face or via phone). Prior to the interviews, the guide was

send to the interview partners to assure their proper preparation. All interviews were semi-structured and conducted following an iterative approach, continuously adapting the interview guideline with newly gained insights (Gibbert et al., 2008; Siggelkow, 2007). The interviewees of the different case firms were a combination of project members or executives from Western headquarters and the respective target markets or affiliated subsidiaries. After the interviews, the accumulated data was triangulated with internal company documents (e.g. organizational charts, presentations and memos) and publicly available secondary data sources. This particular combination enabled us to achieve the most holistic portrayal of the innovation and its characteristics for our analysis.

2.2.2 Data analysis

In order to evaluate the cases appropriately, we applied open coding as supported by Atlas Ti software. As a first step, open coding was performed by analyzing sentences and phrases in all case interviews, searching for and categorizing themes. To enhance the validity and reliability of our findings the collected data was triangulated with secondary sources (company documents and publicly available material) (Davis & Eisenhardt, 2011). This iterative alteration between data and emerging themes also diminished the biases regarding recall and rationalization and thus increased the consistency of the results (Locke, 2001; Miles and Huberman, 1984). Applying this method, we were able to identify four distinct clusters of Frugal Innovation. In a second step, we consulted the secondary data (case database) to validate our preliminary findings. For this, we included 237 cases of Frugal Innovation, which we collected over a period of more than 8 years starting in 2009 (count includes 33 primary cases). The available data was again analyzed independently with Atlas Ti by the authors and the two research assistants (Mayring 2007), identical to the data in the first phase. From this, we were able to confirm the identified clusters based on the 33 primary cases (see Table 2). In a third phase, we further consolidated the results of the first two phases. We analyzed all clusters comprehensively, thus achieving a better understanding of the interplay of all factors involved and the consequent manifestation of characteristics of an innovation, as well as the underlying mechanisms and strategic implications that the market choice yields. All analyses passed through various iterations until the findings generated a strong and consistent picture.

Case	Company description	Employees (approx.)	No. Interviews
1	Industrial technology	140.000	3
2-5	Chemical producers	110.000	7
6	Mechanical and thermal process engineering	10.000	6
7	Home appliances	60.000	2
8	Optical systems	25.000	1
9	Agricultural machinery	10.000	2
10	Financial self-service	25.000	1
11	Applications for mobile living	6.000	1
12-13	Medical diagnostic imaging	55.000	2
14-15	Piping systems, machining and automotive	15.000	1
16	Agricultural machinery	2.000	1
17	Pumps and pump systems	20.000	3
18	Building materials	100.000	2
19-20	Water management	<20	4
21	Medical devices	6000	2
22	Packaging solutions	4000	1
23	Medical equipment	110.000	2
24	Energy production	<20	2
25	Medical imaging systems	<20	1
26	Polymer-based systems	20.000	3
27	Twisting and cable machines	10.000	1
28	Electronic power systems	600	2
29	Wire processing	2.500	2
30-31	Medical imaging	50.000	3
32	Medical equipment	<20	1
33	Medical imaging systems	400	1

Table 2: Overview of primary of case firms

2.3 Findings

Analysis of the 237 cases in this study revealed two distinct aspects regarding Frugal Innovation. Firstly, it became apparent that Frugal Innovations are always disruptive to the market environment they are introduced to. Drawing on definitions from Christensen & Raynor (2003), Frugal Innovations fall either into the category of low-end disruptions or new-market disruptions. Low-end disruptions target customers at the lower end of the respective market, which are often underserved in terms of the market offer available. New-market disruptions on the other hand always compete against non-consumption in the early stages and thereby create new markets in the first place. Alternative solutions competing with these products or services are either completely out of financial or geographical reach for the targeted customer or do not exist at all. Frugal Innovation that fall into this category therefore face no comparable competition and incumbents are absence in most markets. Later, these innovations pull customers from the original value network seeking solutions that are more affordable to own and simpler to use. Secondly, the activity focus of the firms varies depending on market choice. For some Frugal Innovations the focus is placed on activities along the value chain and less on the solution itself. For other Frugal Innovation the opposite is the case. The solution is at the center of all activities and the value chain (activities) follows accordingly. Based on the twofold differentiation four distinct clusters of Frugal Innovation were derived in this study. The resulting x-axis was labelled ‘Impact on market’ (Low-end disruption and New market disruption) and the y-axis ‘Activity focus’ (Value chain and Product/Service) (see Figure 3). In the following sections, the findings per cluster are presented in detail. Additionally, for each cluster the focus of typical firms regarding the four aspects ‘Strategy’, ‘Organization’, ‘Processes’ and ‘Technology’ was rated (High = 3; Medium = 2; Low = 1) in comparison to the other clusters (see Figure 4-7).

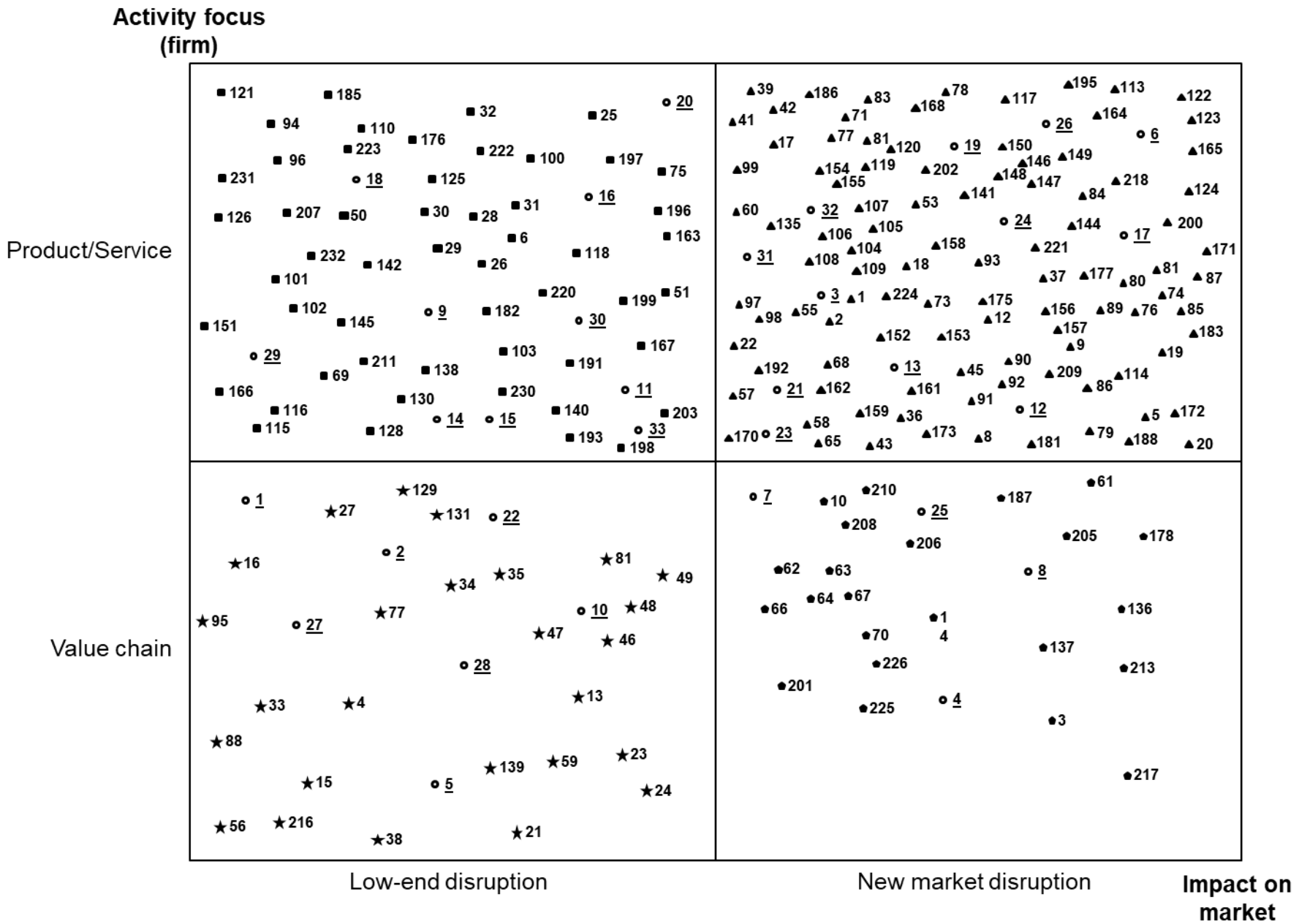

Figure 3: The resulting 4 clusters of all analyzed cases (n = 237)

2.3.1 Cluster 1 (Value chain/Low-end disruption)

The Frugal Innovations in this cluster are characterized by a focus on substantial cost reduction during the value creation process and a concentration on core functionalities that lead to an optimized performance level. However, all solutions in this cluster are based on existing products or services and compete with other (local or regional) low-cost competitors, thus creating so-called low-end disruption in the target market. Competition in these markets is based mainly on cost advantages, efficiency enhancements or a combination of both. In many cases, these innovations target B2B customers in China, India, Indonesia or the emerging middle-class in countries summarized under terms such as BRIICS, MINT3 or the Next 11. These customers are looking for industrial machines offered at a very low price, still good-enough in their functionality and output. The solutions are adapted to be operated more easily by less qualified personal (e.g. simple touch displays), operated with less complexity (e.g. less program variability) or the de-automation of certain steps in the process as it is cheaper to perform them manually, due to low labor costs in the target markets (e.g. packaging). When it comes to B2C products or services in this cluster, functionality changes by reduction or adaptation to the specific context of use. Cars or motorcycles for example offer less comfort, are more robust and are easier to maintain in comparison to their Western counterparts. In terms of strategy and technology, the focus of the case firms was rather low. The overall strategy of companies in this cluster was not adjusted and the required technology existed either from previous generations or in related industries. However, for firms to be successful in this cluster, it is important to focus on the activities along the value chain as most value is generated here by improving efficiency and effectiveness. Further, from an organizational perspective firms need to challenge their current practices and as we saw in many cases adapt or build the value chain from scratch. Even though targeted at a much larger customer base, these solutions are identical across all global markets and do not require or offer local/regional adaptations. Unfortunately, these solutions appeal only to a small proportion when it comes to Western customers, as these products and services are associated with low quality and in some cases do not meet the high Western safety standards. A positive example of a product that would fit into this category, which fares well in Western and emerging markets, are Dacia`s low-cost cars. In terms of industries most firms in this cluster are from machine engineering (e.g. production machines or components), automotive and transportation (e.g. cars or motorcycles) or financial services (e.g. ATMs). Other industries included are low-cost software or communication solutions (see Table 3).

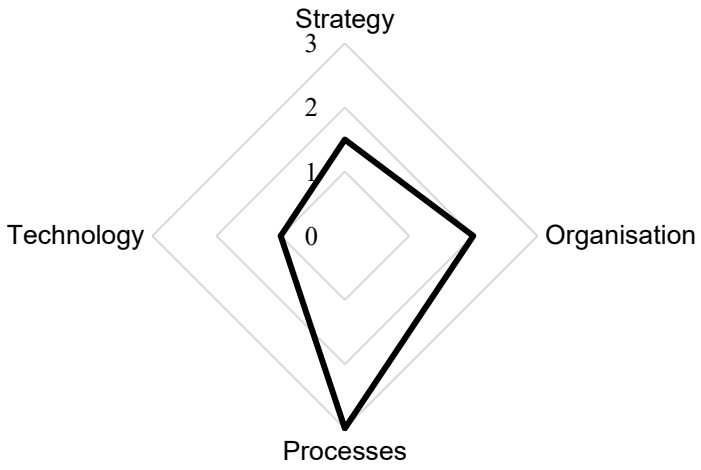

Figure 4: Cluster 1 (High = 3; Medium = 2; Low = 1)

2.3.2 Cluster 2 (Product/Service/Low-end disruption)

The Frugal Innovation cases in the second cluster are characterised by product or service adaptations to suit the exact needs of the target customer in their respective context. In this cluster, the solution occupies the centre of attention regarding the firm's activities. The value chains of the firms are adapted accordingly to create the solution, developed to cater specifically to thus far underserved customers. Innovations in this category are based on existing products; however vary substantially in terms of characteristics and most often their business model. As in the first cluster, these innovations cause low-end disruption in their markets but do compete more successfully as they are tailored more specifically to the needs of local customers. In addition, these innovations primarily target the emerging middle class customer in emerging markets (see Cluster 1) or rather advanced segments in developing markets such as Kenya, Tanzania or the like. The majority of products in this cluster can be found in the healthcare sector, followed by agriculture (e.g. tractors), machine engineering (e.g. industrial scales) and energy-related solutions (e.g. lights). Other products target the construction (e.g. concrete), cooking (e.g. stoves) or water management (e.g. measurement tools) segment. Products in this cluster include fMRI, X-ray machines or diagnostic test that are significantly cheaper and much easier to handle by the local staff. The same is true for the energy category with turbines, wind, solar and light solutions. Further, machines for the use in agriculture or production are functionally adapted to match the exact needs of local people. Here, it is remarkable that products do not simply have less functions but more specific functions that are often only available in this particular Frugal Innovation and not in their Western

counterparts. These types of innovations enables firms to offer their solutions at a much lower price point and simultaneously focus on core functionalities and optimized performance levels for the customer. Another factor that sets this cluster apart from the first is the fact that firms focussed much stronger on the environmental impact and the longevity of their solutions. Besides, the product adaptations many solutions in this group were also coupled with new business models such as leasing or pay-per-use to account for the fact that people in these markets are not able to immediately come up with the money to pay for a tractor or the like. Entering markets as they are described here, requires a strong focus on strategy and technology as firms are departing from their original solutions and established value chains. Arguably the organisation itself and the processes need to be adapted but do follow strategy and technology respectively.

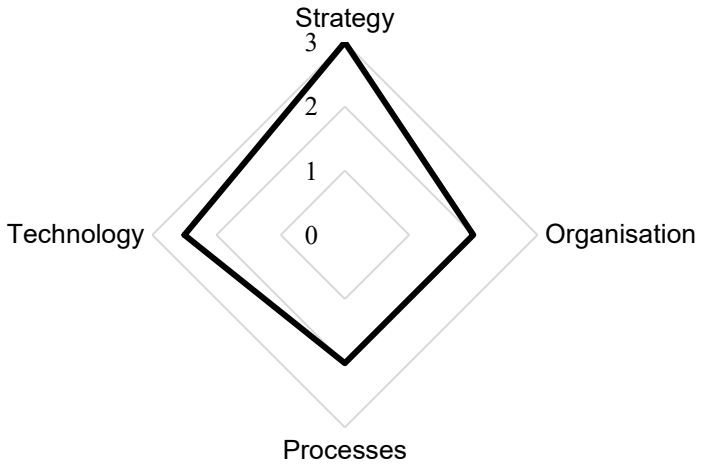

Figure 5: Cluster 2 (High = 3; Medium = 2; Low = 1)

2.3.3 Cluster 3 (Value chain/New market disruption)

Perhaps, one could describe the Frugal Innovations in this cluster as the most radical cases in this study. All products and services are based on a new product architecture, which enables entirely new applications and simultaneously offer an optimized performance level with a concentration on core functionalities at a much lower price. The firms responsible for the Frugal Innovations reported that they developed their solutions from scratch focusing on simplicity and convenience thus ending up with very radical innovations. These solutions are the first of their kind, aiming at the so-called non-customer and thus creating new-market disruption. These Frugal Innovations face no competition from neither local nor international firms. The only alternative to these

solutions is non-consumption as described earlier. Without these products or services, the targeted customers are simply excluded from participation in the formal economy. In most cases, the solutions in this cluster cater to the fulfilment of basic needs in emerging and developing markets, targeting customers from the BoP up to the emerging middle class. This includes housing (affordable and sustainable shelter), healthcare (neonatal/infant care, diagnostics, portable and robust solutions), water management (purification and measurement), energy (off-grid sustainable power generation, light, food preparation) and financial services (mobile banking/money and micro insurances) (see Table 5). Overall, three aspects are standing out for the Frugal Innovations in this cluster: Firstly, these solutions in many cases transform formerly B2B markets into B2C markets. This is necessary due to the absence of a formal industry sector or institutions in the market environment. Thus, people need to serve themselves by using for example off-grid energy solutions. Secondly, almost all solutions either encompass a digital component itself or rely on digital infrastructure during the utilization. Through this, missing infrastructure in the respective markets can be substituted and/or costly physical components can be potentially avoided. Some solutions are digitized completely from the start such as micro-insurances and mobile banking solutions making physical branches or the like superfluous. Thirdly, many of the solution in this cluster are applicable beyond their intended segments and increasingly find their way into Western markets as well. Especially, solutions from the healthcare, energy and financial services sector become increasingly popular among Western customers due to their simplicity and convenience offered at a very low price point. This holds true for B2C as well as for B2B solutions and across industries. Even though the potential customer base is huge, firms need to be aware of the challenges involved when targeting these kinds of markets. Creating a Frugal Innovation that falls into this cluster is certainly the most demanding in terms of strategy and organizational setup, including the processes as well as the development of specifically tailored innovations targeting people who are considered as non-customers in most aspects of their lives.

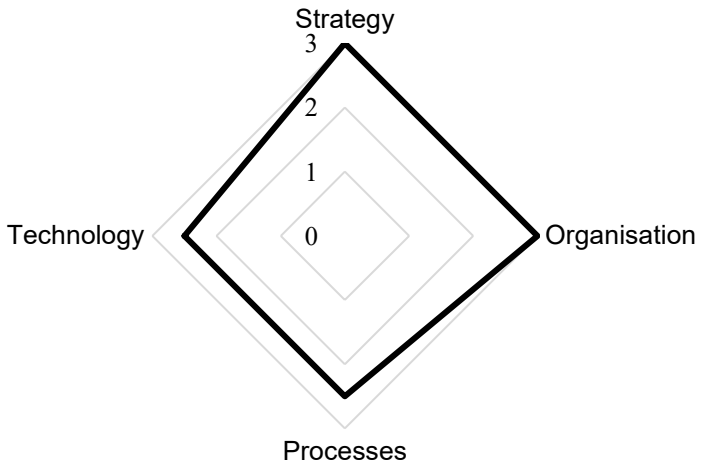

Figure 6: Cluster 3 (High = 3; Medium = 2; Low = 1)

2.3.4 Cluster 4 (Product/Service/ New market disruption)

Innovations in the fourth and last cluster again target non-customer, thereby creating entirely new markets respectively new market disruption. Competition for these solutions does either not exist or is out of financial or geographical reach to the intended customer. This cluster contains two main categories (see Table 6). The first is composed of mainly low-grade 'entry' technology and electronics (e.g. white goods, communication technology or consumer electronics). These technologies have been out of reach for customers in the targeted markets mainly due to high prices and a lack of availability. People in lower income classes of emerging markets and the rising middle class in developing markets become first time eligible customer through these offerings. The second category in this cluster contains modified services and procedures in the medical and education sector that focus on efficiency to be affordable for customers in the emerging middle class but also to people at the BoP. Offers are for example the dispensation of medicine, delivery of surgeries and other emergency services such as ambulances. In addition, educational services are offered for the first time by integrating digital components, which substitute costly or unavailable physical ones (e.g. teaching material). Further, certain services are only possible because the revenue model varies significantly from its Western counterparts. Most innovations in this cluster have a strong focus on the creation of efficiencies throughout the value chain to deliver an affordable product or service. Especially, the medical and educational services are based on innovative ways of service delivery. The products itself are adapted only to the extent that they reach the required price point and that certain functions cater to the environment they are used

in. In terms of focus, the firms in this cluster reported that the processes and the strategy are at the heart of their activities. Targeting customers that fall into this cluster requires a new strategy and processes that are efficient and effective to reach the required prices and function. Further, the organisation needs to be adapted significantly, especially towards the end of the value creation i.e. in the service delivery that happens in the markets itself. In terms of technology, all cases apply existing solutions that are recombined or repurposed. In none of the cases do we see newly developed components. Firms in this cluster rely on the innovative use of existing technology or recombination.

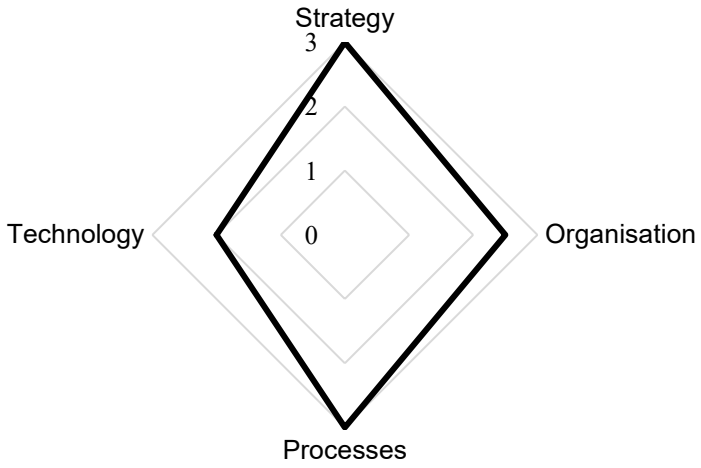

Figure 7: Cluster 4 (High = 3; Medium = 2; Low = 1)

2.4 Discussion

This study provides insights on the consequences and implications of market choice regarding Frugal Innovation. In particular, this research finds that all Frugal Innovations studied here create one of two forms of disruption. These products and services create either a low-end disruption or even a new market disruption in the market they target. One could even argue that Frugal Innovations that create new market disruptions also create low-end disruption as these are often overachieve when it comes to the requirements and prerequisites of the target markets. Overall, the cases in this study reinforce the notion that Frugal Innovations are disruptive innovations as suggested by earlier studies (Christensen & Raynor, 2003; Markides, 2006; Wan et al., 2015). While extant research has already highlighted that resource-constrained innovations create new low-cost segments of existing markets (Hang et

al., 2010) this study suggests that resource-constrained innovation create new markets, if they entail new applications. These discoveries add to the growing body of literature that explores under which circumstances and conditions disruptive innovations can be achieved. As disruptive innovations are seen as an important phenomenon in competitive strategy and thus for the growth of a company, this moves Frugal Innovation further towards the center of attention for both managers and academics. In line with suggestions of earlier studies (Wan et al., 2015; Hart & Christensen, 2002; Li, 2013) emerging and developing economies have been found to be a crucial source of disruptive innovation for firms. The environments and circumstances in these markets stimulate disruptive innovation as they challenge established designs, processes, structures and business models. By shaping the needs of the customer, the market environment shapes the manifestation of the characteristics of a specific Frugal Innovation. The significantly different market and institutional environment in emerging markets forces firms to tailor their solutions to meet the challenges in these markets to address the target customer. Thus, the market of choice determines the approach a firm follows in their Frugal Innovation endeavor to a large extend. This is a crucial realization, as it is important to understand the driving forces behind these innovations to make them more predictable and manageable. Further, this study brings forth the idea that there are different types of Frugal Innovations and consequently different means, actions and foci are required to achieve them. This not only helps to understand the phenomenon of Frugal Innovation more deeply but also offers immediate guidance for firms venturing into emerging and developing markets. The four clusters reveal that the choice of target market requires the firms to focus on different aspects during the process. Further, it shows that markets are not to be differentiated geographically but rather by the type of disruption, the Frugal Innovation causes. Building on the insight that characteristics of the target market shape Frugal Innovations (Brem & Wolfram 2014, Lehner & Gausemeier 2016, Tiwari & Herstatt 2014, Weyrauch & Herstatt 2017), this paper contributes to a better understanding of the impact of market choice on the Frugal Innovation itself, linking the type of target market to the characteristics of innovation.

2.5 Conclusion and further research

This study offers first insights regarding the implications and consequences of market choice for Frugal Innovation. By introducing four distinct clusters of Frugal Innovation, the widely used umbrella term is broken down, allowing academics and firms to

understand the phenomenon more precisely and in the context of individual markets. These findings are particularly relevant due to the increasing significance of Frugal Innovation, which have been suggested as a potential means to unlock the tremendous growth potential that lies within emerging and developing markets. We believe this study is a valuable addition to earlier publications on Frugal Innovation for practitioners and scholars alike. Based on the findings presented in this study future research should further investigate the disruptive potential that might be inherent in Frugal Innovations and the growing body of evidence that suggests emerging markets are an important source of disruptive innovation. So far, disruption is mainly attributed with technology, products or business models, however not with the markets or customer segments itself. Insights generated here also add to the long-standing debate on whether disruptive innovations are created or discovered. It becomes apparent that it would be a vital next step to advance insights regarding Frugal Innovation by studying the context and circumstance the customer finds herself/himself in to identify the specific implications & consequences. Derived from this, research should study how firms actually achieve disruptive innovation and what the exact role of the market in this is. This hold several new implications for the current structures and processes in established innovation practice. Another path of inquiry in the context of these findings is the challenge of ambidexterity that Western firms have to tackle by catering to an ever-increasing range of customers across market segments. Handling both high-end innovation and Frugal Innovation in one company is a severely underexplored theme that requires in-depth empirical investigation. Lastly, since these findings are based on qualitative data from case studies again, research in the field of Frugal Innovation should start investigations based on quantitative data to further add to the discussion in academia and provide firms with deeper insights. Also, our findings hold several managerial implications. Firstly, managers need to understand the consequences and implications of market choice concerning innovation, specifically regarding innovation for emerging and developing markets in great depths. Secondly, firms need to gain a profound understanding of their (new) target markets and the non-customer in order to serve them effective and efficiently. Thirdly, companies need to translate their insights regarding customers and markets correctly into specifically tailored strategic, processual, organizational and technological actions to develop solutions and business models in order to serve the targeted customer successfully.

2.6 Appendix

Case	Industry	Product/Service
1	Energy	P
2	Food	P
5	Clothing	P
10	IT	P
22	Machine engineering	P
27	Machine engineering	P
28	Electronic	P
4	Agriculture	P
13	Other	P
15	Agriculture	P
16	Machine engineering	P
21	Service platform	S
23	Motorcylce	P
24	Automotive	P
27	Automotive	P
33	Automotive	P
34	Automotive	P
35	Automotive	P
38	Service platform	S
46	Financial services	P
47	Financial services	P
48	Financial services	P
49	Financial services	P
56	Software	S
59	Hardware	P
88	Nutrition	P
95	Machine engineering	P
129	Machine engineering	P
139	Healthcare	P
216	Communication	S

Table 3: Cluster 1

Case	Industry	Product/Service
9	Agriculture	P
11	Cooking	P
14	Machine engineering	P
15	Machine engineering	P
16	Machine engineering	P
18	Construction	P
20	Water management	P
29	Machine engineering	P
30	Healthcare	P
33	Healthcare	P
6	Agriculture	P
25	Agriculture	P
26	Construction	P
28	Agriculture	P
29	Agriculture	P
30	Agriculture	P
31	Agriculture	P
32	Automotive	P
50	Construction	P
51	Construction	P
69	Consumer electronics	P
75	Other	P
94	Energy	P
96	Energy	P
100	Energy	P
101	Energy	P
102	Energy	P
103	Energy	P
110	Energy	P
115	Energy	P
116	Energy	P
118	Energy	P
121	Energy	P
125	Energy	P
126	Industrial instruments	P
128	Machine engineering	P
130	Machine engineering	P
138	Healthcare	P
140	Healthcare	P
142	Healthcare	P
145	Healthcare	P
151	Healthcare	P

163	Healthcare	P
166	Healthcare	P
167	Healthcare	P
176	Healthcare	P
182	Healthcare	P
185	Healthcare	P
191	Healthcare	P
193	Healthcare	P
196	Healthcare	P
197	Healthcare	P
198	Healthcare	P
203	Healthcare	P
207	Consumer electronics	P
211	Water management	S
220	Cooking	P
222	Cooking	P
223	Cooking	P
230	Healthcare	P
231	White goods	P
232	Machine engineering	P

Table 4: Cluster 2

Case	Industry	Product/Service
3	Housing	P
6	Machine engineering	P
13	Healthcare	P
17	Water management	P
19	Water management	S
21	Healthcare	P
23	Healthcare	P
24	Energy	P
26	Energy	P
30	Healthcare	P
31	Healthcare	P
32	Healthcare	P
1	Housing	P
2	Housing	P
5	Agriculture	P
8	Other	P
9	Agriculture	P
12	Agriculture	P
17	Platform	S
18	Agriculture	P
19	Meteorology	S
20	Platform	S
22	Water management	S
36	Healthcare	S
37	Financial services	S
39	Financial services	S
41	Financial services	S
42	Financial services	S
43	Financial services	S
45	Financial services	S
53	Energy/Education	S
55	Housing	P
57	Consumer electronics	P
58	Air purification	P
60	Consumer electronics	P
65	Consumer electronics	P
68	Consumer electronics	P
71	Hygiene	P
73	Hygiene	P
74	Water management	P
76	Water management	P
77	Hygiene	P

78	Other	P
79	White goods	P
80	Water management	P
81	Hygiene	P
83	Hygiene	P
84	Hygiene	P
85	Water management	P
86	Water management	P
87	Water management	P
89	Water management	P
90	Water management	P
91	Water management	P
92	Water management	P
93	Cooking	P
97	Energy	P
98	Energy	P
99	Water management	P
104	Energy	P
105	Energy	P
106	Energy	P
107	Energy	P
108	Energy	P
109	Energy	P
113	Energy	P
114	Energy	P
117	Energy	P
119	Energy	P
120	Energy	P
122	Energy	P
123	Energy	P
124	Energy	P
135	Healthcare	P
141	Healthcare	P
144	Healthcare	P
146	Healthcare	P
147	Healthcare	P
148	Healthcare	P
149	Healthcare	P
150	Healthcare	P
152	Healthcare	P
153	Healthcare	P
154	Healthcare	P
155	Healthcare	P

156	Healthcare	P
157	Healthcare	P
158	Healthcare	P
159	Healthcare	P
161	Healthcare	P
162	Healthcare	P
164	Healthcare	P
165	Healthcare	P
168	Healthcare	P
170	Healthcare	P
171	Healthcare	S
172	Healthcare	P
173	Healthcare	P
175	Healthcare	P
177	Healthcare	P
181	Healthcare	P
183	Healthcare	P
186	Healthcare	P
188	Healthcare	P
192	Healthcare	P
195	Healthcare	P
200	Healthcare	P
202	White goods	P
209	Other	S
212	Healthcare	P
218	Cooking	P
221	White goods	P
224	Energy	P
227	Energy	P
228	Industrial instruments	P
229	Energy	P

Table 5: Cluster 3

Case	Industry	Product/Service
4	Nutrition	P
7	White goods	P
8	Healthcare	P
25	Healthcare	P
3	Nutrition	P
10	Agriculture	P
14	Energy	P
61	Consumer electronics	P
62	Communication	P
63	Consumer electronics	P
64	Consumer electronics	P
66	Communication	P
67	Communication	P
70	Consumer electronics	P
136	Healthcare	S
137	Consumer electronics	P
178	Healthcare	S
187	Healthcare	S
201	Healthcare	S
205	Healthcare	S
206	Education	S
208	Agriculture	S
210	Logistics	S
213	Shopping	S
217	Communication	S
225	Education	S
226	Education	S

Table 6: Cluster 4

3. Paper B: Knowledge Transfer in the Context of Frugal Innovation

Co-authored by Jonas Böhm and Christoph H. Wecht

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Abstract

In this paper, we explore knowledge transfer in the context of Frugal Innovation (i.e. a specific form of resource-constraint innovation). Based on original data from 11 case studies, we observe two distinct clusters. Firms in the cluster 'Active' are signified by their direct experience in the target market. Companies in the cluster 'Non-active' were not physically present in the target market prior to the Frugal initiative. Further, three distinct phases emerged along the value creation process: (a) Market research, (b) Development and (c) Go-to-market. It became evident that firms from the cluster *Non-Active* are confronted much more with an influx and outflow of knowledge. Transfer in both directions requires significantly more effort. With this research, we contribute to the growing body of literature on Frugal Innovation and the emerging middle class. We conclude this study with a discussion of the implications of our findings for management practice and research.

Keywords: Frugal Innovation, knowledge transfer, emerging markets, resource-constraint innovation, BoP, emerging middle class

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3.1 Introduction

Over the past decades, emerging and developing countries keep growing faster than Western economies, which increasingly face stagnating or even declining growth. Today, over 70% of global economic growth comes from emerging and developing countries (IMF, 2016). This shift lead to the often-described phenomenon of the emerging middle-class. Billions of people advance from poverty and thus become eligible first-time customers for many Western companies. Currently, counting approximately 2 billion people, the emerging middle-class, is projected to more than double to 4.9 billion by 2030 (Pezzini, 2016). The growing middle class in emerging and developing markets has become and will increasingly become one of the critical economic growth drivers (London & Hart, 2004; Prahalad, 2012; Prahalad & Hammond, 2002). In order to capture the full potential of these markets Western firms need to address the emerging middle-class with suitable solutions. It is well established in the literature that solutions developed for these markets need to be distinctly different from the ones offered in Western markets in aspects such as price, features, user-friendliness, ease of maintenance and many more (Anderson, Markides & Kupp, 2010; Prahalad, 2012). The main reason behind this is the vastly different contexts in these markets such as a significantly lower per capita income, distinct customer requirements, political instability, limited infrastructure and institutional voids. Taken together these constraints pose an enormous challenge for firms planning to serve these new markets (Ricart, et al., 2004). This forces Western firms to not only rethink their products or services but also their entire business process and models (Bhatti & Ventresca, 2013). Given these challenges, some organizations have realized that they cannot sell their solutions simply at a lower price point or offer adapted solutions. A stream of literature that deals with this situation aggregates under the term Frugal Innovation, which represents innovations that are specifically developed for resource-constrained customers in the emerging middle class. (Sehgal, Dehoff, & Panneer, 2010; Sharma & Iyer, 2012; Zeschky, Winterhalter & Gassmann, 2014). In contrast to other low-cost innovations, Frugal Innovation are not simply re-engineered solutions but rather rely on a new product or service architecture in combination with a new business model, both of which are specifically tailored to the needs and requirements of customers in resource-constrained contexts. Among the first and most crucial obstacles is the transfer of knowledge, particularly market knowledge, when organizing for Frugal Innovation. The main challenge lies on the conversion of tacit market knowledge to explicit knowledge that is used during new product development process (Ameri & Dutta, 2005). Here, knowledge needs to be

developed and leveraged throughout the firm to enable Frugal Innovation. This is essential since the constraints and specific requirements of customers in emerging markets must be at the center of every Frugal Innovation initiative. Despite increasing numbers, publications on Frugal Innovation have almost exclusively focused on conceptual aspects or the outcome level (products or services). However, research has yet to investigate the strategic organization of appropriate processes and structures, more specifically, the activities and capabilities that enable the successful transfer of technical and market knowledge in the context of Frugal Innovation in Western companies. The aim of this paper was to identify processes and structures enabling appropriate knowledge transfer in the context of Frugal Innovation considering the entire value creation process. For this purpose, we applied a qualitative research approach using in-depth multi-case studies. Based on these insights, we have illustrated the distinct process steps and the appropriate structures. Additionally, we have presented practical and theoretical implications that result from the findings of our research. This study is particularly relevant since the significance of Frugal Innovation is increasing drastically. We believe this article is a valuable addition to prior works on Frugal Innovation for practitioners and academics alike. This paper proceeds with a discussion of Frugal Innovation and elaborates on the significance of exploring the challenges and mapping the process in its entirety. Afterwards, we describe our research method, the data presented and introduce our findings. Lastly, we conclude this study with a discussion of the implications for managerial practice and future research.

3.2 Background

The academic community has recently exhibited an increasing interest into the investigation of how firms create solutions for customers in resource-constraint segments in emerging markets. The fact that the dominant logic of the global economic landscape has been changed fundamentally puts Western companies into a conundrum. The overall shift towards emerging markets is no longer only true for production sites and sourcing activities like the ones seen in India and China but also for customers. A growing number of customers demand solutions that vary significantly from Western ones. Consequently, leading firms have started to innovate tailored products and business models for these new customer segments. Such innovations are summarized under the umbrella term ‘resource-constrained innovations’ (Ray & Ray, 2010; Sharma & Iyer, 2012). They differ significantly from

traditional innovations in developed markets, which are typically targeted at the affluent customers at the top of the economic pyramid. Advanced innovations are based on the latest technology and have high premium quality, while offering a wide range of functionalities (Govindarajan & Ramamurti, 2011). In contrast, resource-constrained innovations offer a completely different value proposition. They are typically low-cost and entail some sort of tailored functionality that creates unique value in resource-constrained environments in emerging markets (Ernst et al., 2015; Zeschky, et al., 2014).Coming from a capability perspective the most challenging are so-called Frugal Innovation. The term 'Frugal Innovation' has been used to denote innovations specifically developed for resource-constrained customers in emerging markets (Sehgal, Dehoff & Panneer, 2010; Sharma & Iyer, 2012). These innovations have been shown to have significant influence on the processes and the overall value chain that are being characterized by the market context (Prahalad, 2005). They require the most complex technical and organizational capabilities from firms. Other terms for Frugal Innovation are Ghandian innovation (Prahalad & Mashelkar, 2010) or Jugaad (Cappelli et al., 2010; Petrick & Juntiwasarakij, 2011; Sharma & Iyer, 2012). These terms emphasize the specific Indian context in which such innovations have often been created. In contrast to other resource-constraint innovations, Frugal Innovations are not reengineered solutions but originally developed products or services for very specific applications in resource-constrained environments. The debate around Frugal Innovation has been growing for years, stimulating different discussions in management practice and academia. Still, the focus is on conceptualizations and definitions (Zeschky, Winterhalter & Gassmann, 2014) that are strongly characterized by markets and customers, which shape the challenges associates with Frugal Innovation heavily (Anderson & Markides, 2007). Moreover, substantial parts of research focus on strategic aspects of the Bottom of the Pyramid (BoP) (Prahalad, 2005; Williamson, 2010), the emerging middle-class and their significance for Western firms (London & Hart, 2004). Additional areas of research are the role of sustainability (Brem & Ivens, 2013), pattern-based approaches to development (Lehner & Gausemeier, 2016), the relevance of business models (Eyring, Johnson & Nair, 2011) and rather anecdotal case evidence (Radjou & Prahbu, 2015). Few publications consider knowledge transferability in the context of Frugal Innovation (Altmann & Engberg, 2016). However, no publication focusses on the organizational processes and structures along the entire value chain that enable the appropriate transfer of technical and market knowledge, which is essential when organizing for Frugal Innovation. Knowledge transfer in the context of Frugal

Innovation has a particular relevance since firms have to deal with and learn about first time respectively non-customer. In this context, knowledge flow is described as aggregate flow between internal organizational units (Gupta & Govindarajan, 2000) but can also happen outside of the firms boundaries. Often, first-time customers in underserved areas are at the center of these innovation efforts, requiring that firms learn to develop new solutions defined by entirely new parameters. The knowledge and insights that are gathered during the market research phase need to be relayed precisely to all relevant stakeholders along the value chain to guarantee a successful Frugal Innovation initiative that captures the requirements of the customer. In previous research, knowledge transfer has been found to be a driver of performance, whereas the adoption plays a big role (Andersson, Buckely & Dellestrand, 2015). Knowledge transfer being at the forefront of MNE research has been described as the attempt to close gaps between existing knowledge and what is readily available throughout the organization (Cool, Dierickx, & Szulanski, 1997; Pfeffer & Salancik, 1978; Pfeffer & Sutton, 2000; Repenning, 2002). However, knowledge transfer activities need to be managed and coordinated to yield successful results (Andersson, Buckely & Dellestrand, 2015). Firms need strategic adaptations to their processes and structures to enable the successful transfer of newly acquired knowledge into their organization. Besides enabling the transfer of knowledge at various steps along the value chain, processes and structures need to be organized in a way that allows them to overcome all challenges associated with Frugal Innovation. Therefore, it is surprising that few if any publications have been describing these processes. So far, publications have focused on definitions, conceptualization and the overall mindset or the outcome that manifests in products or services. Other publications have investigated very specific aspects such as effects on sustainability or business models. However, very few publications have looked at the activity level and the effects on processes and workflows. In this research, we have highlighted the transfer of knowledge in the context of Frugal Innovation.

3.3 Methodology

The aim of this paper is to investigate how a firm organizes to enable the transfer of knowledge along the value creation process. Since research in the field of Frugal Innovation is still in its infancy, a qualitative research approach was adopted using a multiple case study design (Yin, 2014). This method is appropriate when the literature on a phenomenon is fragmented or incomplete (Eisenhardt, 1989). Our investigation started out with an analysis of the current state of extant literature on Frugal Innovation to identify dominant schemes in this field. After this step, we generated a semi-structured interview guide to validate our findings from the literature research. In a first step, we interviewed the case companies to map the initial process of each Frugal Innovation initiative with a focus on knowledge transfer. In a second step, we identified the underlying challenges from the transcripts and matched them with our findings. Lastly, we interviewed the companies again and this time asked explicitly about knowledge transfer along the process. All cases presented in this study are drawn from an extensive database that was accumulated between 2009 and 2016. Currently, this database comprises 250 cases of Frugal Innovation and is constantly updated. Each case is based on either personal interviews, comprehensive secondary data analysis or a combination of both. Further, to ensure a better generalizability of the results, we applied the following criteria to select the final 11 cases presented in this study: most frequent (1) industries, (2) target markets and (3) distribution in terms of company size. All cases are based on 24 personal semi-structured interviews that lasted between 45 to 120 minutes. Additionally, in-depth secondary data from internal documents or established sources was drawn upon to triangulate the findings (Gibbert, Ruigrok, & Wicki, 2008). Our sample covers companies from <20 to 140.000 employees. Table 7 displays the analyzed cases and an overview of the interview partners in this study. Each case was transcribed as a single case study and analyzed independently by two researchers (Miles & Huberman, 1984) in an iterative fashion shifting between data and literature. Then we proceeded with the cross-case analysis in the same manner until the findings reached a consistent picture (Eisenhardt, 1989).

Table 7: Case companies and interview partner

Case	Company description	Employees (approx.)	Interviewee role	No. Interviews
Med_1	A start-up with a general purpose stationary radiography system	<20	Chief Executive Officer/Founder	1
Med_2	Start-up producing ecological, autonomous and modular sterilization solutions	<20	Chief Executive Officer/Founder	1
Energy_1	A start-up focussing on sustainable off-grid power generators	<20	Chief Executive Officer/Founder Co-Founder	2
Electrical_1	Leading solution provider of electronic power systems	640	Head of Product Management Head of Development Center	2
Wire_1	Globally leading supplier in wire processing	2.600	Head of New Technology Product Manager	2
Manu_1	Manufacturer of applications for mobile living (climate, hygiene, food & beverage)	6.400	Head of Division Developing World Products	1
Engineering_1	A global market leader in mechanical and thermal process engineering	10.600	Chief Technology Officer Head of Corporate Technology India Head of Innovation Lab Project Engineer Project Manager R&D Process Manager	6
Manu_2	A worldwide manufacturer of piping systems, machining and automotive	14.200	Head of R&D	1
Engineering_2	Global leader in pumps and pump systems	18.900	Business Development Business Manager Africa	2
Plastics_1	A leading company in polymer based system and service solutions	19.000	Head of Corporate Strategic Development Head of International Business Development Head of Strategic Technology Management	3
Indus_1	Global leader in industrial technology	140.000	Head of R&D Head of Safety Head of Production Development & Support	3

3.4 Findings

Analysis of the case data resulted in two different clusters. Companies in the first cluster *Active* have direct experience through physical presence (e.g. sales offices, logistic networks, production sites) in the target market. On the other hand, companies in the cluster *Non-active* are not physically present in the target market. However, it is still possible that companies in this cluster offer products or services in these markets (e.g. Kenya) through regional offices (e.g. South Africa) or have employees with personal experience of the target market. Further, when considering knowledge transfer three distinct phases emerged along the value creation process, which were labelled: (a) Market research, (b) Development and (c) Go-to-market. In the following, we will present our findings starting with the cluster Active followed and then directly contrasted with the cluster Non-active.

3.4.1 Market research

Cluster: Active

The first step for all firms was to gather market knowledge about the newly selected customer segments. For all companies the segments targeted with their Frugal Innovation were comprised of non-customers. Except for the start-ups that were specifically founded to develop Frugal Innovations, all firms were targeting high-end segments before. Therefore, they had to not only understand the market environment but also learn about the requirements of the targeted groups in great depth. Companies in the cluster Active leveraged the local in-house resources that were present in the markets already. In the cases of Indus_1, Wire_1 and Manu_2 a business unit or a subsidiary were established locally to even further improve the transfer of knowledge from the market into the company. This increased local presence enabled the firms to continuously transfer knowledge throughout the entire process. Wire_1 established their subsidiaries by acquiring a local player, whereas Manu_2 identified a local firm to form a joint venture. By this in-depth knowledge about the target market could be brought into the company. The processes and structures in all cases were designed to guarantee a maximum of openness and accessibility for all involved stakeholder of the company. Further, a variety of research methods (e.g. interviews, market surveys/ studies, feedback from local employees/ internal or external experts) were employed to create significant knowledge for all following steps in the value chain. Since, the firms had to deal with new circumstances, small dedicated and hand selected teams were responsible for the market research. In the

early phases, knowledge was exchanged in close personal interaction and a big emphasis was put on the documentation of findings and the processing of such.

Cluster: Non-active

The Non-active firms faced the major challenge that they had no direct connection to the market from the start. However, the methods used to gather market knowledge were similar to the Active firms, yet more extensive since they started with little to no basis. In the case of the Non-active firms, the team which performed the market research was composed largely of the development team later responsible for the Frugal Innovation itself. Through this set-up, the gap between the first and second phase was much smaller. By this, firms reduced the challenge of organizing for influx of knowledge and the transmission to the development team. Due to the market novelty, many firms in this cluster resorted to accessing knowledge from similar markets that were already served by the firm. For this to be successful, the firms gave a great deal of freedom to the team responsible for the Frugal Innovation initiative.

3.4.2 Development

Cluster: Active

The next phase is the development and depends largely on the insights that were collected during the market research process. Firms emphasize that they have to make sure that the market knowledge is translated accurately into product requirements that constitutes the final solution. In most cases the product development process was carried out within the regular R&D structures. However, the development teams worked closely with the market research team. Here, it is especially important that the transfer of knowledge is done very diligently and that both sides can communicate openly. Input from outside the project team should be limited and employees in this context require more liberties and different reporting structures than regular projects. This knowledge transfer is mainly fostered by tightly knit networks or communities and by placing people in the local context. Firms that developed in established R&D structures also mentioned the importance of iterative cycles between all involved parties to thoroughly anchor the knowledge after it has been transferred. Only Manu_2 established a new development lab directly in the market because they wanted to create a close connection between the market research and development. Overall, all firms had dedicated project manager who were responsible for all areas and were equipped with the necessary mandates. In addition, during the development

several external stakeholders got involved (e.g. suppliers, external consultants and local institutions). This poses an additional challenge since the firms needs to go beyond intra-firm knowledge and exchange on an inter-firm basis. For this process, it is incremental that the firm established process and structures that serve as a guideline and protection of all parties involved. Only within this ‘safe space’ can employees transfer knowledge adequately to the other parties and by this reach the desired outcome. Further knowledge from external or local partners needs to be fed back into the organization via the same channels that are use between market research and development. Another connection were knowledge transfer needs to be enabled is a connection to the later stages of the go-to-market processes (e.g. marketing, services and business development).

Cluster: Non-active

In the development phase of the Frugal Innovation the firms of the Non-active cluster relied much more on external input. Med_1, Energy_1, Med_2 and Manu_1 closely collaborated with academic, industrial and local partners in the process. As in the first step, the firms needed to organize for an influx of knowledge but as well for a coordinated outflow of knowledge to enable the partner in working on the project. IndusEquip3 circumvented this challenge by setting up a separate business unit with full support of the board. Further, many departments were involved from the beginning.

3.4.3 Go-to-market

Cluster: Active

In the last phase, the go-to-market process, various activities are combined. For our cases we found that procurement, logistic and production are not the primary foci points for knowledge transfer in the active firms. Here, the processes and structures are mostly identical to regular products and services. However, the interviewees mentioned that it is important to communicate the goals of the initiative to the involved stakeholders. In the later stages of the go-to-market process the transfer of knowledge from market research and development becomes much more crucial. In the marketing, sales, distribution the specific market environment again moves to the center of the firm’s activities. Insights that have already been generated need to be communicated and supplemented with outside knowledge where necessary. Again, similar to the market research, the sales and service aspect is very important. Especially in the beginning, a lot of knowledge is gained from the interaction and feedback of the now

first-time customers. The generated knowledge here needs to be fed back into the company and made available to everybody who needs access.

Cluster: Non-active

As in the Active cluster firms mainly resorted to existing structures in matters of procurement, logistic and production. Med_1, Energy_1 and Med_2 resorted to outsourcing these activities and needed to transfer their knowledge outside of the firm's boundaries. For this to be successful, the firms established clear mechanisms to support their employees. Again, since no physical presence in the markets existed the firms resorted to collaborative partner networks in matters of distribution, sales and service.

3.5 Discussion

Our findings suggest that processes enabling the transfer of knowledge vary according to the prior presence of the firm in the respective target market. The firms in the Non-active cluster are much more reliant on external knowledge inflow throughout the entire value creation process. Local knowledge of the target market is not existent on an organizational level in most cases and therefore needs to be brought in and created. For firms in the cluster Active knowledge to some extend is available and needs to be leveraged in the context of the Frugal Innovation initiative. Therefore, Non-active firms face a threefold burden in that they need to create knowledge through external sources, integrate the knowledge internally and transfer it to the respective stakeholders. In a next step, both clusters need to transform and apply the gathered knowledge. The new product development process is quit complex, since it requires a constant interaction and control based on the transfer and exchange of knowledge. Here, again tacit knowledge needs to be converted into explicit knowledge to enable a successful project. During this phase, it is important that either new knowledge is added or existing knowledge from the knowledge base can be assessed (Ameri & Dutta, 2005). In the later phases, this pattern continues as the Non-active firms collaborate much more with partners. It becomes evident that for this knowledge transfer to be successful the companies need to implement formal mechanisms. Nevertheless, informal mechanism need to be incorporated, since these have been found to influence behavior and thus led to more satisfactory transfer performance (Foss, 2007). Overall, mechanisms of knowledge transfer need to be considered at the level of communities and networks, which imply social ties that facilitate learning.

3.5.1 Practical Implications

Our findings aide firms with setting-up the appropriate processes and structures to engage successfully in Frugal Innovations, depending on the transferability of knowledge considering their experience regarding the target market. Our findings can be applied to the entire value chain from the initial idea to the final Frugal Innovation or individually for one of the three phases (a) Market research, (b) Development and (c) Go-to-market. The practical value can be differentiated into firms that do and do not have Frugal Innovation experience. Firstly, companies that do have experience can use it as a benchmark for existing processes, currently enabling their Frugal Innovation. They can also use the results as a reference point, if they plan to expand their existing initiatives in new markets or launch new projects. Secondly, firms that have no experience with Frugal Innovation can clearly identify themselves with one of the two clusters. This helps to assess which processes and structures are appropriate for the respective company. Our findings help companies to improve their understanding of Frugal Innovation and the appropriate activities linked to it. Further, it serves as a benchmark to evaluate existing processes or in the case of a first-time initiative to adapt organizational processes accordingly.

4. Paper C: Managing Strategic Dualities: The Allocation of Autonomy in Western MNCs innovating for Resource-constrained Customers

Co-authored by Joakim Vincent, Stephan Winterhalter and Oliver Gassmann

Abstract

Western multinationals are increasing their efforts to innovate for resource-constrained customers in emerging markets. Past studies highlight how this unique context influences and shapes the characteristics of products and services developed for these emerging economies. This study employs a multiple case study approach at 12 Western MNCs who developed resource-constrained innovation for emerging and developing markets. It is being investigated how firms manage the strategic duality of serving customers at the upper end of the economic pyramid as well as simultaneously reaching into medium and lower segments. The results indicate that the allocation of autonomy, specifically strategic and operational autonomy, is used as a management tool to reserve this conflict. Further, the disruptive potential of resource-constrained innovation is discussed.

Keywords: Strategic dualities, autonomy, resource-constrained innovation, Frugal Innovation, subsidiaries, headquarters

4.1 Introduction

More than 70 percent of the global economic growth is coming from emerging and developing markets already today (International Monetary Fund, 2016). Within the last decade, the impact of emerging and developing markets on the international economy has increased enormously (Drummond, 2012; Mudambi, 2011). Currently, the emerging middle-class accounts for two billion people and will most likely more than double to 4.9 billion by 2030. Furthermore, it has been predicted, that emerging market segments, especially those developing in the middle- and lower-income classes, will be the major growth driver in the near future (Dobbs et al, 2012; Schmid, Dzedek, & Lehrer, 2014). Especially African countries will experience tremendous population growth with 109 percent until 2050, representing more than half of the global population growth (United Nations, 2015). This power shift of the global market creates new customers with different demands and living in different circumstances compared to their Western counterparts. All companies that want to participate in this development and by this stay relevant in terms of global competition have to consider these new demands and circumstances (Govindarajan & Trimble, 2012). Innovative products, services and business models that address these new demands and market segments have been summarized under the term resource-constrained innovations (Ray & Ray, 2010; Sharma & Iyer, 2012). Unlike advanced innovations, which are traditionally aimed at offering the highest possible quality standards as well as state-of-the-art technology and maximal functionality to affluent customers (Govindarajan & Ramamurti, 2011), these innovations take an entirely different approach. Typically, resource-constrained innovations are designed to be very low in terms of costs for the customer both in purchasing price and over their lifetime. More importantly, they often offer a specifically adapted function or design that create custom-tailored value for the customer and are thus superior to other high-end products and services for that particular region (Ernst et al., 2015; Zeschky, Winterhalter, & Gassmann, 2014). Some companies have already begun to design such innovative solutions to capture the tremendous growth in emerging and developing markets. Recently, some products, initially designed as resource-constrained innovations, caught the attention of Western customers in developed markets as well (i.e. Reverse Innovations). These customers are either part of the middle-class themselves, or they belong to the increasingly expanding group of eco-conscious customers. Both groups are attracted by the affordability and sustainability of these solutions, which brought them back to the Western market as well (Von Zedtwitz et al., 2015; Zeschky, Widenmayer, & Gassmann, 2014).

As more Western firms venture into these markets, it becomes clear that they are facing internal conflicts – so call strategic dualities. In the case of the firms studied here, they face the conflicting imperative of serving customers in different market segments (high-, middle and low-income) as well as different target markets (West vs. emerging markets). As these markets become increasingly important, firms need to find a way to deal with the rising complexity and the well-known challenge of global integration vs. localization. Especially, process studies that aim to understand how firms manage strategic dualities are low (Birkinshaw et al., 2016) and especially in combination with resource-constrained innovation in the emerging market context.
Hence, the overarching research question is: How do firms manage strategic duality in the context of emerging and developing markets and what role does autonomy play? This study is based on a multi-case study approach (Eisenhardt, 1989) with 12 Western MNCs that developed resource-constrained innovations for emerging and developing markets. The contribution of this research is fourfold. Firstly, this study introduces the empirical differentiation strategic and operational autonomy (Birkinshaw & Morrison, 1995; Keupp, Palmié, & Gassmann, 2011) in the context of innovation in emerging markets. Secondly, it is shown how firms use these two types of autonomy to deal with, respectively manage strategic dualities (established vs. new market segments) in the context of emerging and developing markets (Birkinshaw, Bouquet, & Lee 2016). Thirdly, this study contributes to literature on subsidiary initiatives (Birkinshaw, 1997), as it is amongst the very few to provide evidence of initiatives involving emerging market subsidiaries in Western firms. Lastly, this research contributes to literature on innovation by advancing and refining the understanding of the relationship between product novelty in resource-constrained innovation and disruptive innovation (Christensen & Raynor, 2003; Govindarajan & Kopalle, 2006).

4.2 Theoretical background

4.2.1 Resource-constrained environments in emerging markets

So far, it has been rather common to treat all markets as a homogenous group. Yet, especially emerging and developing markets are considerably different amongst themselves (Cao, Wang & Wang, 2009; Yao, Zhang, & Hanmer, 2004) and additionally throughout their customer segments (Hoskisson et al., 2013). What unites the majority of emerging markets are customers that tend to be on the lower end of purchasing power (London & Hart, 2004; Sanchez & Ricart, 2010), institutional voids, (Khanna,

Palepu, & Sinha, 2005; Khanna & Palepu, 2000), and the overall lacking infrastructure (Hoskisson et al., 2013). These aspects are usually less pronounced in urban areas compared to the more rural parts of the countries (Anderson et al., 2010). Taken as a whole, these factors pose a significant challenge for Western firms, especially if they persistently stick to their traditional approaches (Mair & Marti, 2009; Sanchez & Ricart, 2010). Further, simply adapting an already existing product or service conceptualized for the Western markets will likely be insufficient as well due to the different customer needs and their local context (Govindarajan & Trimble, 2012). These customers in middle- and lower-income segments in emerging and developing markets require a different type of innovation. Resource-constrained innovations are tailored specifically to the individual customer needs. Over the past 20 years, literature has classified different types of resource-constrained innovations (Ray & Ray, 2010) within the last two decades. These types are defined based on their value propositions and the novelty of their products (Wan et al, 2015; Zeschky et al., 2014). Common to all types of resource-constrained innovation is their goal to increase affordability by cutting costs. Thus, they are capable of disrupting low-end markets (Christensen & Raynor, 2003; Hang et al., 2015; Lim, Han, & Ito, 2013). Relevant to this study are Good-enough Innovations (Gadiesh, Leung, & Vestring, 2007) and Frugal Innovations in particular (Cunha et al., 2014; Zeschky, Widenmayer, & Gassmann, 2011). Good-enough Innovations start with a Western perspective, by re-engineering already established Western products and adapting them to the needs of an emerging market context and the respective customer needs. Frequently cited examples of Good-enough Innovation products are the Tata Nano (Lim et al., 2013; Ray & Ray, 2011), Haier's washing machines (Hang, Chen, & Subramanian, 2010), or Logitech's computer mouse M215 (Trimble, 2012). In line with the notion of Good-enough Innovations, all functions that did not add any value to these products, were eliminated, while new functions, that improved the functionality in the new context were added (Zeschky et al., 2014). Frugal Innovations on the other hand, start with a completely new design, not previously used in Western markets (Cunha et al., 2014; Wan et al., 2015; Zeschky et al., 2011). These innovations, which rely on completely new concepts rather than an adapted Western product, are commonly labeled application innovations (Zeschky et al., 2014, Winterhalter et al., 2017). Given that Frugal Innovation provides entirely novel applications, it has been claimed to be the most radical type of all resource-constrained innovations. Examples of Frugal Innovation include M-Pesa, a mobile phone application that already today manages close to 70 percent of Kenia's GDP flow (money transfer and microfinancing services), the

MittiCool clay fridge, which keeps food cool without the use of electricity; and General Electric's portable ECG machine for doctors who work in remote regions (Immelt et al., 2009). The new circumstances require Western firms in particular to consider re-designing and adapting their well-established organizational structures and processes in order to meet the requirements of the new market context (Wan et al., 2015; Zeschky et al., 2014). The insight from research on how companies can best deal with these new challenges in emerging economies is still limited. One such insight is, that Western companies are advised to open a new R&D division locally in the target market, in order to allow them to design new products based on the requirements of that region (Govindarajan & Ramamurti, 2011; Immelt et al., 2009; Zeschky et al., 2011). A trend towards R&D internationalization, including moving units to emerging countries, has already been observed within the last decade (Athreye, Tuncay-Celikel, & Ujjual, 2014; Dunning & Lundan, 2009; Gassmann & Keupp, 2008). The finding indicate that R&D units need to be locally present to understand their customers in order to derive products that meet their needs (von Zedtwitz & Gassmann, 2002). Another central aspect of the ongoing discussion is the autonomy of local subsidiaries responsible for resource-constrained innovations. Results from various studies claim that they need to be autonomous and strictly independent of the units for developed markets (Govindarajan & Ramamurti, 2011; Mudambi, 2011) to work properly and produce the desired results. For this study, it will be differentiated between strategic and operational autonomy. Strategic autonomy is defined as the ability of a business unit or a subsidiary to set their individual and independent agenda (Bailyn 1985; Perlow 1998). Operational autonomy is the ability of units to manage, organize and determine their activities autonomously (Bailyn, 1985; Keupp et al., 2011). Further, these units should be encouraged to specify their own strategic plan (Bailyn, 1985; Keupp et al., 2011). This notion seems to be necessary, since Western R&D units tend to have a rather inflexible idea of their methods and procedures, which were developed for high-end products and may limit the local R&D units from adapting to the new demands (Govindarajan & Ramamurti, 2011; Govindarajan & Trimble, 2012; Immelt et al., 2009). For example, many of the successful R&D units in China have managed to save costs and speed up the R&D cycle, by adapting to the local conditions, including the available technologies and manufactures, and the market demands (Gassmann & Han, 2004). It becomes apparent that it is a tremendous challenge for firms to adapt to not only new customer requirements but also to next market context. Firms need to change their strategic approaches, their structures as well as their processes. Additionally, firms need to cope with the difficulty of serving their

established high-income or high-tech segments as well as simultaneously middle- and low-income or end customers in a diverse set of geographical contexts. This challenge represents a typical strategic duality (Birkinshaw, et al., 2016), which have to be frequently be managed by firms in a business environment that is growing increasingly complex. Other examples of more well-known strategic dualities include flexibility and differentiation (Ghemawat & Ricart Costa, 1993), alignment and adaptability (Gibson & Birkinshaw, 2004) or global integration and localization (Bartlett & Ghoshal, 1989). In general, the term is applicable to any pair of conflicting aspects that a firm needs or wants to address (Evans & Doz, 1999). The question that remains is how firms solve the strategic duality in this particular context and what role the allocation of autonomy has. Thus, the purpose of this article is to investigate how firms that innovate for resource-constrained customers in emerging and developing markets manage this strategic duality and what the role of autonomy is in this context is. By better understanding this connection, we can inform a theoretical discussion about strategic dualities and autonomy in the context of new market segments in emerging and developing markets. Further, practical insights can contribute to a better understanding for management, which increasingly has to deal with the complexity of serving customers varying customer segments across many geographical markets.

4.3 Method

This study investigates the allocation of autonomy in Western MNCs that innovate for resource-constrained customers considering their strategic dualities. In the following the sampling, data collection and analysis are elaborated upon.

4.3.1 Sampling

The firms in this study were chosen following the guidelines on ‘purposeful sampling’ by Lincoln & Guba (1985). Interview partners within the firms were chosen considering who would be most able to provide insights into our research question concerning strategic dualities and the allocation of autonomy. These first interviewees were then used to identify further informants within the firm. As in past research, sampling suggested that we start with managers and then work our way down the chain of command. To study the research question at hand, theoretical sampling was applied (Eisenhardt, 1989) by choosing 12 Western MNCs that successfully launched Good-enough and Frugal Innovations in emerging or developing markets. In all cases, the innovations studied were the first of that kind for each MNC. Six of these MNCs developed Good-enough Innovations (i.e. re-designs for emerging markets) and the

other six developed Frugal Innovations (i.e. application innovations). Table 8 displays detailed information regarding the case firms. The whole research process was set up very much as an iterative process, whereby data collection, analysis and the identification of additional cases was performed simultaneously. Through this approach, it was possible to build on existing information to generate increasingly focused data that was relevant to the research question at hand. The goal was to achieve ‘theoretical saturation’ as referred to by Glaser & Strauss (1967).

Case (# Interviews)	*Company description*	*Location of HQs*	*Employees (global)*	*R&D expenditure*	*Market*
MedTech1 (2)	Worldwide leading providers of diagnosis, screening, treatment & monitoring solutions in the medical equipment industry. Long standing experience in China, where it maintains several manufacturing sites.	*Europe*	*>35.000*	*>USD 1.1 bn*	*China & India*
MedTech2 (5)	Producer of advanced medical equipment in imaging, laboratory diagnostics equipment, & information technology. Present in China for two decades. Established local production network.	*Europe*	*>40.000*	*>USD 1.6 bn*	*China*
MedTech3 (3)	Provider of medical premium solutions in areas such as imaging and information technologies, patient monitoring systems & medical diagnostics. China operations were started in the 90s.	*North America*	*>50,000*	*>USD 1.6 bn*	*China & India*
MedTech4 (2)	Leading Western MNC active in diagnostics & testing, The company maintains several production and sales units in China & South East Asia.	*Europe*	*>4,000*	*>USD 0.1 bn*	*China*
IndustrialEquiq1 (2)	Internationally leading solution provider for efficient and reliable operation of electronic systems. Factories established in mid 90s in Thailand with further R&D & production locations. Also, marketing, distribution & sales offices in China, Japan and Taiwan.	*Europe*	*>600*	*USD 0.2 bn*	*China*

IndustrialEquip2 (2)	Globally operating technology group is a leading supplier in the wire manufacturing industry. Internationalization market access through several acquisitions in the USA & Japan. Wire_1 maintains several subsidiaries in China & Japan focusing on marketing, sales & service.	*Europe*	*>2.500*	*USD 0.9 bn*	*China*
Manufacturer1 (1)	Core business lies in solutions for mobile living & travel (climate, hygiene & food). Company focusses on all markets with 22 manufacturing sites globally, selling products in 100+ markets through various distributions networks & dealers.	*Europe*	*>6.000*	*USD 0.5 bn*	*Mozambique, Tanzania & Kenia*
Manufacturer2 (1)	Active in piping systems, machining and automotive. Early mergers in the 1980s with major competitor in China (joint venture). Through this, they are able access to various production, sales, & service location, as well as early insights into emerging markets.	*Europe*	*>14.000*	*USD 3.6 bn*	*China*
Manufacturer3 (6)	Leading firm in industrial food processing technologies. They have an exceptional international presence operating in over 140 countries & a long-standing history of products for all segments in these markets.	*Europe*	*>10.000*	*USD 2.3 bn*	*Sub-Saharan Africa*

IndustrialEquip3 (2)	This group is a leader in advance pump solutions. Their products are sold in more than 50 countries. Expansion & acquisitions so far have mainly focused on North America and Europe.	*Europe*	*>18.000*	*USD 3.3 bn*	*Kenia, Tanzania & Uganda*
Manufacturer4 (3)	Market leader in systems and service provider for polymer-based solutions active in automotive, constructions & industry. Expansive global sales and distribution network with production sites in Asia and Africa.	*Europe*	*>19.000*	*USD 0.8 bn*	*Tanzania & Kenya*
IndustrialEquip4 (3)	Global leader in industrial engineering technology in electrification, automation and power grids. Extensive operations across the entire value chain in more than 100 countries.	*Europe*	*>150.000*	*USD 1.4 bn*	*China & Philippines*

Table 8: Case company information

4.3.2 Data collection

The data presented here was collected using two techniques: 1) semi-structured interviews with employees that were involved with the project under investigation and 2) written an electronic documentation provided by the company or publicly available secondary data. Overall, the interviews served as the main source of data regarding the allocation of autonomy, with the additional data serving as crucial sources for supplementary information and for triangulation of the findings (Gibbert, Ruigrok & Wicki, 2008). This combination allowed for a deeper understanding of key aspects and aided in the identification and consequential resolution of potential discrepancies among interviews within each firm (Jick, 1979; Miles & Huberman, 1984). The semi-structured interviews in this study lasted between 45-90 minutes and were all performed by one interviewer to maintain consistency. Each participant received the interview guide in advance to prepare accordingly and gather all required information. In total 32 interviews with 32 interviewees were conducted across all case companies

and the informants varied on functional and hierarchical level to ensure a holistic perspective. Our respondents were CEOs, CTOs, product managers, R&D heads and vice presidents from both the Western headquarters as well as the subsidiaries. Each of the semi-structured interviews was audio-recorded and the tapes were transcribed verbatim afterwards.

4.3.3 Data analysis

The data from the interview was captured via recordings and notes from which full transcripts were created for each case. The interviews stared out with background and demographic information and then moved on to the person and their current position and the role in the project under investigation. Through the open-ended questions in the semi-structured interviews, it is possible to achieve greater accuracy of retrospective accounts (Lipton, 1977). Further, it allows to develop the insights on the spot and to steer the discussions in directions that were not considered in the preparation of the interview. The gathered interview data was analyzed by the use of established coding techniques (e.g., Langley, 1999; Miles & Huberman, 1984) to develop accurate accounts that exactly mapped the reports of our interview partners. This approach allowed us to understand the structures and processes involved in the projects thoroughly. Through this we were able to identify mechanisms and dimensions both top-down and bottom-up, which were present in the data. Breaking down the findings in different concepts, themes and dimensions allowed us to understand all connections in depth (see Figure 8 for data structure).

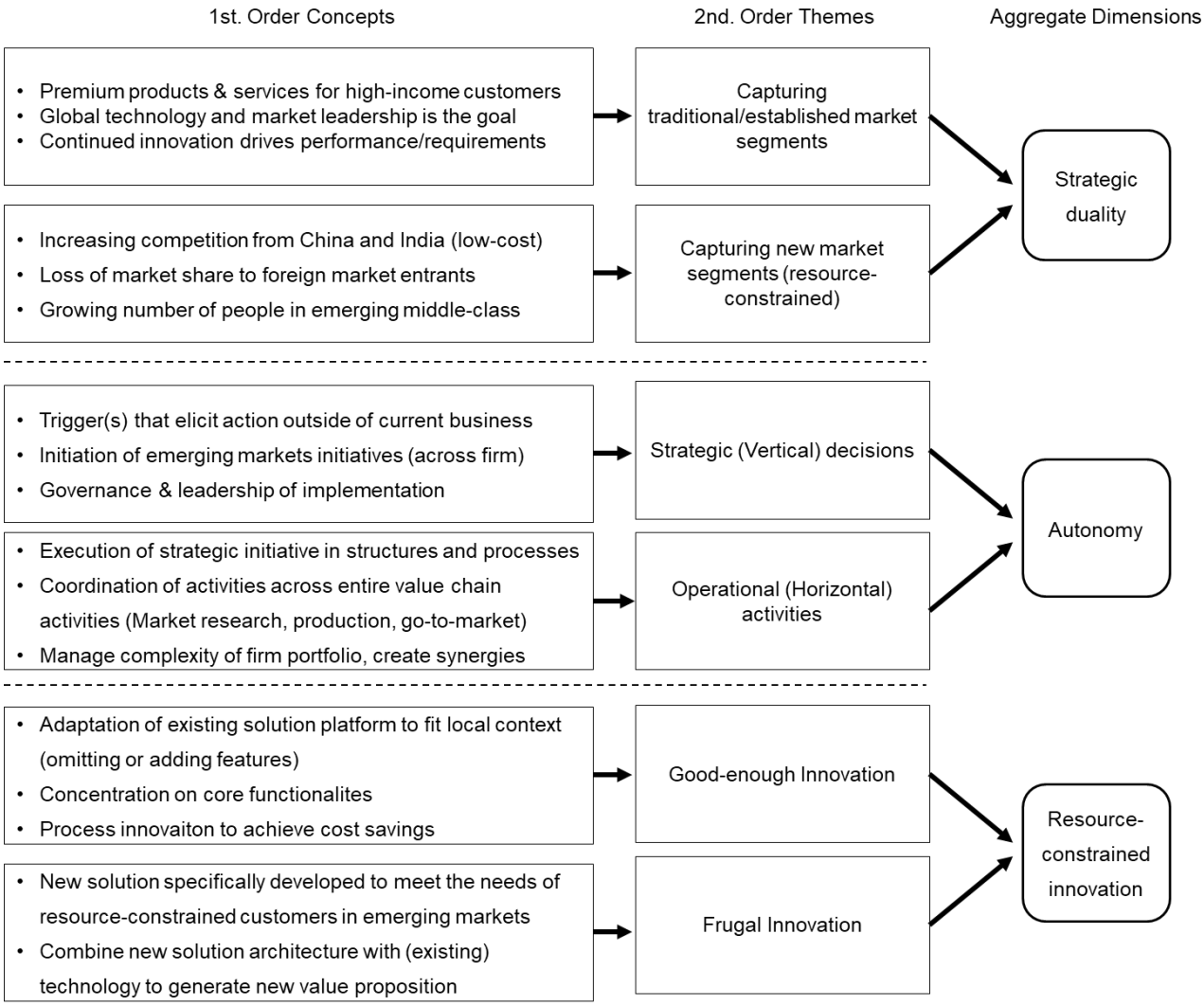

Figure 8: Data structure

4.4 Findings

In this segment, the results of this study are introduced in the following order. Firstly, the schematic process is introduced, which represents how the firms dealt with the strategic duality of serving customers in all economic segments across several global markets and what role the allocation of strategic and operational autonomy played.

Figure 9 shows the difference for companies and the occurrence of the discussed strategic duality. In the left scheme, the regular business proceeding of a Western firm are displayed. They capture customer in high-income/tech segments with a homogeneous product or service offering across the globe. Within the firm there is a strategic and an operational level (value chain), which put simplistic are responsible for the desired result. At the end, the outcome of strategic and operational activities is a high-tech and/or high-end innovation for the respective customer. The right scheme is representative for the case firms introduced in this study. These firms serve high-income/tech segments and capture new market segments (middle- or low-income) simultaneously. From this arises an inherent conflict, as each customer or market segment requires a specifically tailored solution that varies significantly from the global standard for the high-end segment. Therefore, firms need to adapt their activities accordingly. In our cases, it has been shown that firms solve this conflict with the allocation of varying degrees of autonomy. This is done both on a strategic and on an operational level. Afterwards, the firms proceed with their regular activities for the high-end segment and with the adapted activities and respectively allocated strategic and operational autonomy. The outcome in this case is twofold: As in the previous case the firm a high-tech and/or high-end innovation as well as a resource-constrained innovation (Good-enough and/or Frugal Innovation).

Next, the ‘Trigger & Catalyst’ for the resource-constrained projects are elaborated upon. This is followed by a description of the allocation of ‘Strategic autonomy’ and then ‘Operational autonomy’. The remarks regarding ‘Operational autonomy’ are further divided into ‘Market research’, ‘Development’, Go-to-market’, and lastly ‘Product portfolio and brand management’ to allow for a more detailed observation.

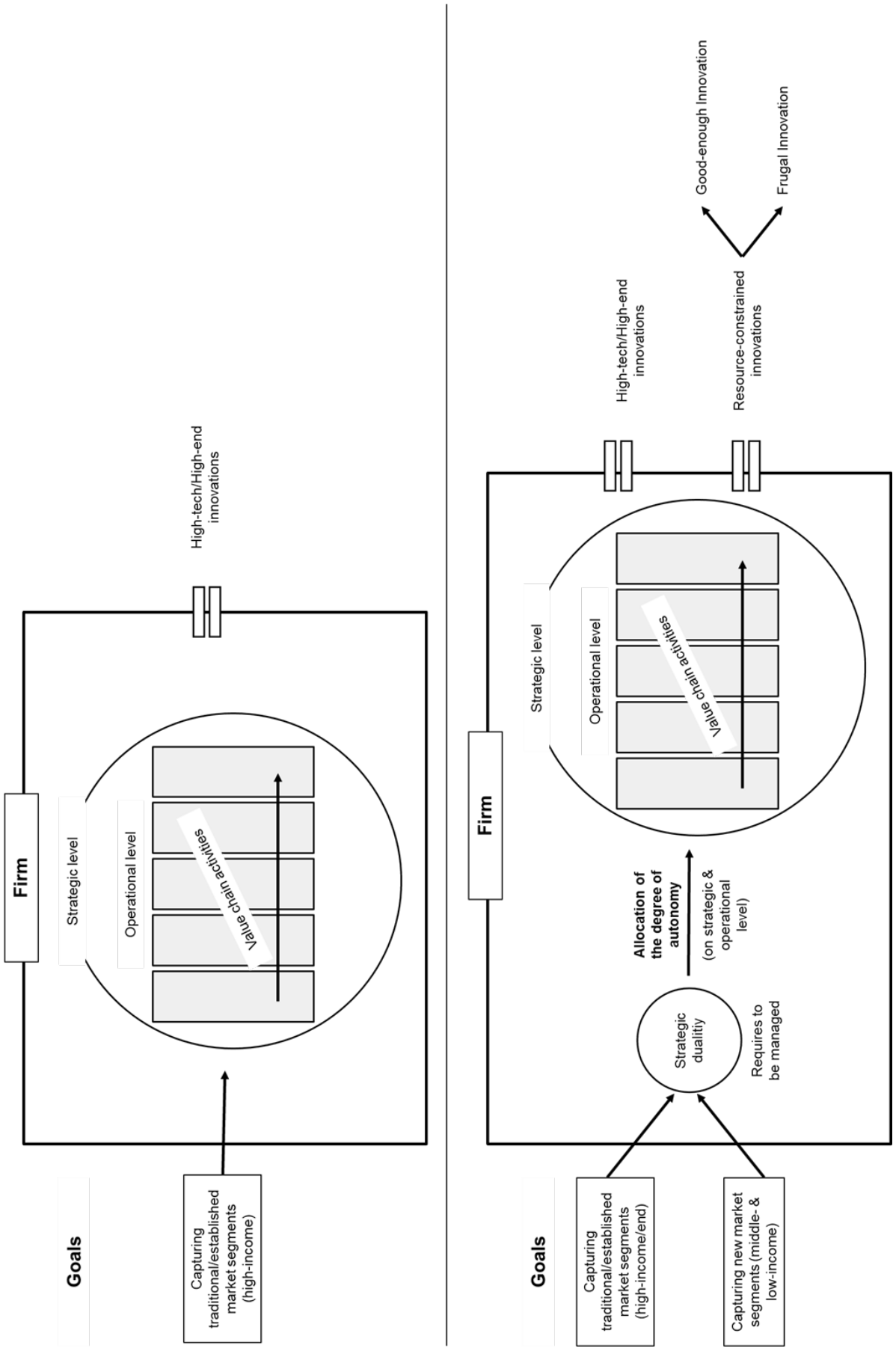

Figure 9: Schematic representation of traditional (left) process vs. RCI (right)

4.4.1 Trigger & catalyst

Among our case firms, we were able to identify different reasons triggering the development of their innovations. In firms MedTech1, IndustrialEquip4 and IndustrialEquip1 the trigger was the growing pressure in the Chinese market, particularly from local low-cost brands. These locals were increasingly able to win over tier-one customers, which all three firms were exclusively targeting. To combat the potential loss of market share, the Western headquarter (HQ) of the firms initiated and consequently developed Good-enough solutions. All innovations were based on existing products of the companies that were adapted to the individual context and customer segment. Later, these products were introduced into several other emerging markets, where the firms experienced similar situations. The second trigger we isolated from our data were market insights, gained through long established local presence in the market. MedTech2, MedTech1 and IndustrialEquip2 were present in the markets with local operational units or representative offices. Manufacturer2 established their market presence through the acquisition of a local low-cost competitor. This enabled the firms to recognize the need for products in customer segments that are underserved or not addressed at all in particular by Western companies. Consequently, MedTech2, IndustrialEquip2 and Manufacturer2 decided to focus on underserved customer segments in China. MedTech1 followed a different approach and focused on customers in severely resource-constrained settings both in its established markets and in new ones. Due to the vastly different conditions and requirements in these segments, MedTech1 engaged in the development of a resource-constrained innovation from scratch. However, a mere adaptation of features, as often the case in Good-enough Innovations, would not have been sufficient. In the early 2000s, an ultra-compact, low-cost, portable ultrasound machine was developed and commercialized by MedTech1. The machine featured a high ease of use, portability and battery based operation for the use in remote rural areas, integration of local languages and a significantly lower price (approx. 80 percent less). The last group of firms is unified by the fact that they specifically set out to develop Frugal Innovation with the intention of serving markets at the Bottom-of-the-pyramid. For MedTech4 this initiative was driven by the recognition that virus detection is still very expensive, requires medical expertise and is inaccessible to a vast majority of the global population. Therefore, they intended to develop a low-cost virus detection device that can be used by untrained people in rural areas. For Manufacturer4, Manufacturer1, Manufacturer3 and IndustrialEquip3 the trigger were corporate social responsibility (CSR) initiatives or internal innovation competitions. From this originated

four Frugal Innovations targeting African countries. After the need for resource-constrained innovation was triggered and recognized, these projects had to be initiated within the company. In case of MedTech1, MedTech2, MedTech1, Manufacturer2 and IndusEquip1 this happened through a group-wide initiative. For Manufacturer3 and IndusEquip3 the executive board initiated the projects as trials under their direct supervision. In some cases, the initiation was linked to the personal agenda of individuals, which recognized the opportunity of markets in emerging and developing economies and had the authority to support these projects (IndustrialEquip4: Head of business unit; MedTech4: CEO and IndustrialEquip2: CTO). In case of Manufacturer1 and Manufacturer4 the initiative was driven by the CSR department and individual mid- to low-level employees for whom it was a personal matter. In case of Manufacturer4, the team had to overcome significant resistance from the management in the beginning of the project mainly due to the unorthodox practices applied (e.g. a lot of travelling). Only after several prizes and a successful launch was the initiative supported. All cases in this research represent first time initiatives of resource-constrained innovation, which were initiated top-down from the Western HQs.

4.4.2 Strategic autonomy

Generally, the responsibility and steering encompasses all relevant decisions such as budget, life cycle management and the structure of operations activities along the value chain. Based on our interviews and the additional data, it has been found that the majority of firms have kept steering and responsibility within their HQs, and thus not transferring strategic autonomy to local subsidiaries (MedTech1, MedTech2, MedTech4, IndustrialEquip1, IndustrialEquip2, IndustrialEquip3, IndustrialEquip4, Manufacturer1, Manufacturer3 and Manufacturer4). Nonetheless, in Manufacturer2 we see a split of responsibility. Here, the Head of R&D located in Europe took responsibility for technical aspects and the Head of the business unit, who commuted between the European HQ and the subsidiary, for functional and disciplinary aspects. At first glance, it seems like MedTech1 has located full responsibility and steering in the subsidiary in China. However, it has to be acknowledged that the responsible manager was an expatriate from the European HQ. This setup resulted in a very close coordination of steering and decisions between the HQ and the subsidiary.

4.4.3 Operational autonomy

When it comes to the organization of the operations along the value chain, the review of the case study documents and our interviews showed a very diverse picture. One common factor was the role of the HQ, which in all cases facilitated, supervised and guided the execution of the resource-constrained projects throughout, only granting partial operational autonomy. As starting point, the HQs set up either a new business unit or a separate project team in charge of the initiative. The interviewees mentioned a lower risk for conflicts, internal politics, and the prevention of organizational issues as motives behind this. It was stated that these projects were expected to require more freedom to operate and more time and financial autonomy to proof the business case. Generally, each of these units or teams was embedded in the company and could access all resources in the company.

Market research: The first step for all firms was market research from which the product features were specified. For this step, the companies applied a large variety of methods reaching from plain desk research to field research and interviews with existing and potential customers, local organizations and experts. Especially the companies that developed Frugal Innovations were very thorough in this process. They needed to understand the specific customer requirements and the contexts that produces them as well as the particular market structure in the new market segments. Many firms resorted to iterative feedback cycles and some worked extensively with rudimentary prototypes (Manufacturer4 and Manufacturer1). In case of the Good-enough firms IndustrialEquip1, Manfacturer2 and IndustrialEquip2 no particular market research process was launched. The local organizational structures were sufficient to derive the product specification from experience and regular meetings with clients. Overall, firms that had existing structures (i.e. local employees, offices, supplier networks) in the markets leveraged these as source for information. Results that were gathered had to be approved by or at least presented to the responsible entity in HQ at all times.

Development: Even though all firms performed rigorous analysis regarding product specification and customer requirements the mindset behind Good-enough and Frugal Innovation varies significantly. Good-enough Innovations are characterized by the adaption or re-design of an existing product. As one of our interviewees at MedTech1 said: ‘What we realized is that we need very basic but very high quality products at a very good price. Every dollar you spend is important, so we do everything to bring

costs down. Our product is unique, as it does not have high-end functionality. However, while it has only basic functionality, it is still high quality using the best components and the best measurements.' Frugal Innovations on the other hand build on a new product architecture that allows for the required characteristics and features. Only core components or technologies are taken from the original product. 'The low-end product is not just a disfeatured high-end product. Low-end customers have very different needs in comparison to the Western ones. They look for very cost effective products: lower price, high reliability, and high efficiency. If we disfeature from high-end systems, we are not able to meet these requirements,' explained one interviewee at MedTech2. In some cases, Frugal Innovation even include features that the premium products do not have. Overall, most firms resorted to developing their resource-constrained solutions within existing structures in the HQ wherever possible. Local structures in the target market were used as sources for information and feedback continuously throughout the process. Some firms as MedTech3 developed their solutions to some extend in their Chinese subsidiary, as did Manufacturer3 in their South African subsidiary relying on input from Asia and Europe. Manufacturer2 also executed some aspects of the development locally with technological support from the European HQ. IndustrialEquip4 conducted a simultaneous development process with the respective business unit and an external development firm to stimulate competition and increase the chances of success. One exception in the development process was MedTech4 that outsourced the entire process to a firm that specializes in the development of innovations for resource-constrained settings. In all cases, the R&D units in the HQs provided the core components and technology. Further, final product specifications and quality guidelines had to always be approved by the respective HQs. In contrast to regular development efforts, we saw many more departments and external parties being involved and giving input during the process.

Go-to-market: The go-to-market process again was very much driven by existing structures to leverage synergies and core competencies. Wherever possible, manufacturing took place in existing structures often in Europe. However, a bigger proportion of activities was outsourced to suppliers in case of IndusEquip2 and IndustrialEquip1 with up to 80-90 percent. Overall, the re-evaluation of suppliers was a big aspect in all firms. The reasons either were the need for new components or cost reduction by e.g. decreasing the distance between production site and supplier. In MedTech1, the Chinese subsidiary was integrated vertically into the global network and was responsible for activities along the value chain (e.g. sourcing, production,

distribution, sales). IndustrialEquip4, due to the magnitude of the entire project, build up the entire supply chain from production sites to sales and service points in the local markets. In most cases, assembly happened in the target markets to some degree. For distribution and sales firms that had existing structures used these (e.g. Manufacturer2, IndustrialEquip2 and IndustrialEquip3). MedTech4, Manufacturer1 and Manufacturer4 organized their commercialization completely or in part through local NGOs or other organizations who sold, distributed and installed the products through their established channels. For the Frugal solutions of MedTech1, Manufacturer3 and Manufacturer1 new sales teams were installed and local service partners were selected to reach the new customer segments.

Product portfolio and brand management: Similar to responsibility and steering, we found that the product portfolio management of the resource-constrained innovations was located in the corresponding HQ with few exceptions. In the cases of Manufacturer3, Manufacturer4, IndustrialEquip4, Manufacturer1, MedTech2 the product portfolio management was simply integrated into the global product portfolio located at the HQs. Of particular interest, considering the initial resistance from the top management is that in Manufacturer4 an entirely new product category for emerging markets was established later on. Similar to this MedTech1, MedTech1, MedTech4 and Electrical established a group wide low-end product portfolio management, specifically for emerging and developing markets. The low-cost product portfolio management is organized parallel to the premium solution portfolio management at the HQ. Even though, IndustrialEquip2 also integrated their Good-enough Innovation into the global portfolio at the beginning, after two years responsibility for the portfolio management was handed over to the local team in the market. Only IndustrialEquip3 and Manufacturer2 directly assigned product portfolio management to the local subsidiary. In terms of branding firms either abstained from a differentiation or set up new products lines (Manufacturer2, IndustrialEquip2, and Manufacturer3). These products can be differentiated from the premium lines with e.g. different color schemes or an additive such as ‘Made by X’ instead of ‘Made in Germany/Switzerland’. In the case of Manufacturer2, a co-branding strategy was selected to leverage the trust associated with the local organization. Branding was always a firm wide choice and thus taken up to the executive boards for decision-making.

4.5 Discussion

4.5.1 Strategic duality, autonomy and localization

In all cases, the initiative to develop resource-constrained innovation was strategically initiated by the HQs in developed markets. Only afterwards, the local subsidiary unit, if existent or the respective business unit was granted partial mandates to e.g. sense product requirements develop aspects of the product locally and in some cases upgrade the product at later project stages. This finding implies a differentiation of autonomy on strategic and operational level, as suggested by earlier literature (e.g. Birkinshaw & Morrison, 1995; Keupp et al., 2011). Findings from the case interviews showed that this division of strategic and operational autonomy was used as a management to overcome the inherent strategic duality of serving established high-tech/end and middle- and low-income/cost segments. For firms it is paramount to keep the complexity at a level that is viable and manageable. In our cases strategic autonomy and with it the responsibility and steering were always at the HQ and only operational autonomy was granted, whereas in most cases just partially. Western HQs clearly assigned the units or teams in charge to develop a product for selected target markets or segments. The local organizational structures were primarily used as source of information regarding market insights and the execution of operational aspects to limit the conflict on this strategic duality. This finding is counterintuitive with regard to extant literature on resource-constrained innovation. Building on literature about subsidiary innovativeness (e.g. Asakawa, 2001; Mudambi et al., 2007), this research suggests that local subsidiaries in emerging markets need strategic autonomy to develop resource-constrained innovations independently and under their own responsibility as a local market initiative (Govindarajan & Ramamurti, 2011; Immelt et al., 2009; Mudambi, 2011). Nevertheless, the data in this study also showed that in the cases of MedTech2, MedTech1, IndustrialEquip4 and Manufacturer2, the subsidiaries were assigned strategic autonomy after the successful launch of the first low-cost product. In other words, strategic autonomy was only assigned to some of the subsidiaries, after they proofed they had the necessary capabilities. The project to test these capabilities was initiated by the Western HQs. This suggests that dynamic subsidiary autonomy (Ambos, et al., 2011) might be very distinct in emerging market subsidiaries. While strategic autonomy was initially not given in any of the subsidiaries or development group, the cases show that units enjoyed different degrees of operational autonomy for market research, development and the go-to-market process. Operational autonomy is defined as the ability of units to manage activities in a way determined by themselves (Bailyn, 1985; Keupp et al., 2011). In contrast,

MedTech1, MedTech4, Manufacturer1, Manufacturer3, Engineering2, and Manufacturer4 demanded the development units to develop a product for rural solutions and provided them a great deal of operational freedom to achieve the new application. Hence, this shows that units that developed Frugal Innovations enjoyed a higher degree of operational autonomy than the units that developed Good-enough Innovations. The Western MNCs organized differently to develop the Frugal and Good-enough Innovations. This is in line with earlier studies that emphasize the importance of local embeddedness of R&D for resources-constrained innovations (e.g. Ernst et al., 2015; Govindarajan & Ramamurti, 2011; Immelt et al., 2009; Zeschky et al., 2014). In all cases, however, the responsible development team was not primarily present in the target market and resided mainly in developed markets where it finalized the design of the resource-constrained product based on insights from sales colleagues and partnerships with e.g. NGOs. This suggests that, not the geographic location of the R&D unit is decisive for resource-constrained innovation but the focus assigned for resource-constrained innovation.

4.5.2 Market extension vs. market creation

Another aspect that these cases showed is the difference in which Good-enough and Frugal Innovation overcome challenges in the market context and either create a market extension into the low-end segment or create an entirely new market. Generally, Good-enough Innovation are able to overcome the constraints in existing customer segments, which could not be reached with products that were developed for Western customers. Now, the new value proposition allows tapping into this market segment. Christensen & Raynor (2003) have described this phenomenon as ‘Low-end disruption’. For example, the CT scanner portrayed in this study was built to ensure a quick patient positioning to reduce the time per patient needed for one scan. Using this machine means that hospitals can reduce lead times, which in turn also reduces the unit cost per scan and thereby increases affordability for patients. These solution requirements also hold true for Frugal Innovation. Yet, these products or services are designed to be function outside of the existing contexts or markets and therefore, can address customers that have never been served before. Through this, Frugal Innovations are able to create entirely new markets and therefore can be described as “New-market disruptions (Christensen, & Raynor, 2003). Frugal Innovations, on the other hand are much more disruptive. Based on the application innovation (Wan et al., 2015), they take a product out of its former context (e.g. a hospital) and transfer it into a new context (e.g. remote and rural areas). The most eminent infrastructure gaps

bridged by Frugal Innovations are electricity, transportation infrastructure, and the lack of well-trained staff in the presented case firms. All Frugal Innovations except Manufacturer3 are highly portable and can be transported into remote areas. Battery operation in the devices ensures that operations can be carried out without access to electricity if required. Most importantly however, the devices can often be operated by non-experts, which bridges the constraint consisting of untrained medical staff. Overall, MNCs were able to enlarge their customer bases significantly by providing cost efficient solutions to customers that could not afford and use premium products before (Govindarajan & Kopalle, 2006). The cases show that Frugal Innovations may also reach segments served by Good-enough Innovations. Additionally, Frugal Innovations created a new market (e.g. the mobile healthcare market for rural areas), which did not exist before. Hence, this instance reflects a new market disruption (Christensen & Raynor, 2003; Govindarajan & Kopalle, 2006). This finding advances a line of literature on disruptive innovation in emerging markets. Specifically, Hang et al. (2014) argued on firm level that innovations from emerging market firms can be both – low-end and new market disruptions. This study further specifies this view by adding a product-centric perspective.

4.5.3 Implications to the literature

The findings from this study advance the discussion surrounding research on resource-constrained innovation in particularly on Good-enough and Frugal Innovations. In many cases, existing studies have adopted a relatively unidimensional perspective on resource-constrained innovation. They rarely account for difference between concepts such as Good-enough or Frugal Innovation and only focus on the low-cost perspective (Govindarajan & Ramamurti, 2011; Ricart et al., 2004; Von Zedtwitz et al., 2015). Additionally, the literature discussion on strategy, specifically strategic dualities and autonomy excludes the context of emerging and developing markets from the discussion in most parts (e.g. Bouquet et al., 2008; O'Donnell, 2000). This study is the first study to link both the discussion on resource-constrained innovation and the on-going discussion around autonomy in the strategy community.
Results from this study challenge earlier notion in the literature on the management of subsidiary and regarding the challenge of strategic dualities and the autonomy granted to development units for resource-constrained innovations (Govindarajan & Ramamurti, 2011; Immelt et al., 2009; Mudambi, 2011). Further, this research is the first to distinguish between strategic and operational autonomy (cp. Birkinshaw & Morrison, 1995; Keupp et al., 2011) in the context of emerging markets and its role in

the management of strategic dualities. Overall, Western HQs in this study are much more involved in resource-constrained innovation activities along the value creation process than earlier research suggested. None of the development units enjoyed strategic autonomy and the initiatives to develop the resource-constrained innovation were in all cases initiated by the Western HQs. Extant research argued that these initiatives were driven by subsidiaries (Govindarajan & Ramamurti, 2011; Immelt et al., 2009; Mudambi, 2011). By introducing operational autonomy, this study refines earlier studies, which only focused on strategic autonomy and suggests that the degree of operational autonomy, together with the initial target market defined, influence the degree of product novelty development units may achieve. By providing empirical evidence, this research challenges the notion that Western MNCs need to establish R&D units in emerging markets in order to develop resource-constrained innovations for emerging market customers (cp. Immelt et al., 2009; Zeschky, et al., 2014). Further, this study introduces autonomy as a management tool for strategic dualities and offers insights into the structural and processual organization (Birkinshaw et al., 2016). This study argues that local R&D in emerging markets are no prerequisite for successful resource-constrained innovation initiatives. Lastly, the distinction between Frugal and Good-enough Innovation reveals that resource-constrained innovations differ in their capacity to bridge institutional voids and resource-constraints and have different effects on market disruption, i.e. low-end vs. new market disruptions.

4.5.4 Managerial implications

The research presented in this study offer findings that help firms to manage the strategic duality of serving multiple segments across global markets by allocating strategic and operational autonomy. Further, the results indicate that if you want to engage in resource-constrained innovation, these projects should be initiated and steered from the Western HQs. Each unit that is involved will receive dedicated tasks and varying degrees of autonomy. For this to be successful, the distribution of autonomy is key to deal with the paradox of strategic dualities. By communicating clearly which target market should be addressed, in connection with the assignment of operational autonomy along the value chain, Western HQs can steer resource-constrained innovation activities successfully. For resource-constrained innovation in Western MNCs, it is more important that the assigned unit is specialized and enjoys high degrees of operational autonomy opposed to being directly located in the target market.

4.5.5 Limitations and future research

Considering the limited amount of publications, research on resource-constrained innovation particularly on Good-enough and Frugal Innovation, many research avenues are yet to be explored. This study set out to explore this phenomenon and to shed light on the inner workings of companies that pursue resource-constrained innovation. For this study, the characteristic limitations of case study research apply (Eisenhardt & Graebner, 2007; Yin, 2014). The central limitation is the sample size, which limits generalizability to some extent, a problem that many qualitative studies face. Therefore, the theoretical contribution of this study lie in proposing new research paths that can be explored in future quantitative studies. Nevertheless, to account for other explanations of our finding, the sample of case companies was selected carefully and represents 12 Western MNCs that developed resource-constrained innovation for an emerging and developing market context (Yin, 2014). However, as favorable as this sampling is, it also has effects on the generalizability of results. Future studies should investigate that the effects are in different industries, what role the end customer plays (B2B vs. B2C) and to what extend the approaches vary due to the target market (Alcácer & Chung, 2011a, 2011b; Yang & Jiang, 2007). This study represents a first attempt on strategic dualities, the role and differentiation of strategic and operational autonomy in the context of resource-constrained innovation. As first results seem promising in regards to extant findings of the literature, future studies should continue to investigate further aspects such as subsidiary embeddedness (e.g. Andersson, Forsgren, & Holm, 2001; Dellestrand & Kappen, 2011), the reasons for success and failure in managing strategic dualities (Boumgarden et al., 2012; Voss & Voss, 2013) or the role of subsidiary and headquarter leadership (Dörrenbächer & Geppert, 2009; Williams & Lee, 2011).

4.6 Conclusion

To conclude, this study offers new findings into the question of how companies manage strategic dualities by allocation autonomy along the value creation process. This was investigated by conducting in-depth case studies with 12 Western MNCs that created resource-constrained innovations. The results were able to show the inner workings of the firms under investigation from which patterns were derived patterns that offer conceptual and practical insights, which will trigger new studies in this area.

5. Paper D: Capturing Resource-constrained Customer Segments: How Western MNCs adapt Value Chains to succeed in Emerging Markets

Single authored

Abstract

Increasingly, Western Multi-national companies (MNCs) are targeting resource-constrained customers in emerging and developing markets in an effort to capture new market segments. For this to be successful many firms are leveraging so-called Frugal Innovations. However, it has been shown that this type of innovation requires a significant change in a firms' business activities namely its value chain. Even though the discussion around this subject is becoming progressively relevant in academia and among practitioners, most publications are still based on anecdotal evidence, focus on conceptual aspects, or the products and services (outcome) itself. Therefore, this study employs a qualitative research approach to investigate how 18 Western MNCs, targeting resource-constrained customers in emerging and developing markets, set up and adapt the structures and processes of their value chains. This study identifies three different clusters ('Made-to-measure', 'Hybrid' and 'Off-the-shelf'), which can be differentiated by 1) the degree of product innovation, 2) the extend of value chain adaption and 3) the consequential degree of localization. These insights offer a deeper understanding of the conceptual aspects as well as practical activities necessary to create Frugal Innovations and consequently capture new market segments.

Keywords: Emerging markets, Value chains, MNCs, Frugal Innovation, localization, Resource-constrained customers

5.1 Introduction

Product and service innovation for emerging and developing markets has taken an important role in the recent academic discourse. Triggered by the work of Prahalad (2012) on the bottom of the pyramid (BoP), the academic community has started to investigate how (primarily) Western firms can do business, potentially resulting in an improvement of the life of people with low income in emerging and developing markets (Prahalad & Hammond, 2002). This idea is further supported by the shift of global economic power towards emerging and developing markets over the past decades. The economic upward trend of many countries in these contexts enables a substantial number of people to rise out of poverty and become part of the so-called emerging middle class (London& Hart, 2014; Anderson & Markides, 2007). Thus, for the first time companies all around the globe perceive these people as potential customers. Already now, emerging and developing markets constitute between 70-80% of the global economic growth and the emerging middle class makes up for two thirds of the global population (UN, 2015). Simultaneously, Western markets, the former drivers of global growth, are stagnating or even declining in their economic power. This development makes emerging and developing markets increasingly interesting, also for Western firms. So far, Western companies only serve a small part of customers in emerging and developing countries. In almost all cases, the products and services sold in these markets are identical to their Western counterparts. However, this allows companies to capture only a small share of the entire market. The remaining majority of people is underserved or not even perceived as potential customers by Western MNCs. In order to maintain growth and to withstand the pressure of emerging companies from emerging markets, firms need to address these customers. Still, making business in these markets poses several challenges to the products, services, and the business conduct of Western companies. People in these markets have much less disposable income, suffer from institutional voids and infrastructure gaps in comparison to Western customers. Due to these and other circumstances, customers in these markets are referred to as resource-constrained customers (Hang et al, 2010). Recent research has already shown that Western MNCs are redesigning their existing solutions (products and services) as well as their established business models (Winterhalter et al., 2017) to account for these differences. One phenomenon that enables firms to serve customers in these market segments is Frugal Innovation. This type of innovation is characterized by a novel product or service architecture, which allows entirely new applications that are specifically tailored to the context of resource-constrained customers and their needs (Cunha et al., 2014; Zeschky, Winterhalter, &

Gassmann, 2014). Research on Frugal Innovation has developed steadily over the past 10 years, along with an increasing interest from practitioners. Yet, existing studies in this field focus on the conceptual level to gain a deeper understanding of this innovation type and its differentiating factors from other similar concepts. Other publications focus on very specific aspects such as implications for sustainability (Brem & Ivens, 2013) or the general impact on society (Nari Kahle et al., 2013), mostly taking a product perspective. Yet, stringent research that investigates the underlying structures and processes along the entire value chain is non-existent. Furthermore, research around Frugal Innovation and new customer segments is based to a large extend on a limited number of recurring cases of which many seem to be based on rather anecdotal evidence. Additionally, it is often the case that the data sets in related publications constitute of a case blend were authors do not distinguish between start-ups, SMEs or MNCs and also mix local companies with Western examples when exploring a research question (e.g. Anderson & Markides, 2007; Lehner & Gausemeier, 2016; Levänen et al., 2016; Rao, 2013; Soni & T. Krishnan, 2014). This is problematic since each of the latter groups face vastly different problems and challenges regarding this type of innovation (e.g. market access or customer insights or product development capabilities). By mixing all cases, the authors fail to account for specific and differentiated challenges. Presenting implications for academia and practitioners for this mix seems of limited value. Drawing the threads of our argument together, it becomes apparent that research needs to examine how firms and particularly Western MNCs manage and organize for Frugal Innovation, thus enabling them to capture new market segments in emerging and developing markets. Consequently, this study combines a holistic approach to study how Western MNCs build and reconfigure value chains activities. In doing so, this study aims to identify the necessary adaptations of established structures and processes along the entire value chain for Frugal Innovations.

5.2 Method

The aim of this study is to identify how Western MNCs build and reconfigure the structures and process along their value chain activities in the context of their Frugal Innovation endeavors. In the following the research design, data collection as well as the analysis of the data is elaborated upon.

5.2.1 Research design and sampling

Adopting a value chain perspective, this paper aims to explore how Western MNCs adapt their structures and processes along its entirety. Even though Frugal Innovation as a concept and approach has gained increasing attention, literature on this particular aspect is virtually absent. Therefore, a qualitative research approach (Yin, 2014) using a multiple case study design was opted for. This is particularly suitable, if the existing literature on the matter at hand is fragmented, incomplete or insufficient (Eisenhardt, 1989) and to answer more broadly defined research questions such as ‘how’ and ‘why’ (Eisenhardt & Graebner, 2007). In addition, the multiple case study design is appropriate to analyze multiple causal factors (Stake, 2013), which supports the objective of this study to generate a holistic understanding. Lastly, this approach offers the possibility to identify novel findings in dynamic and complex contexts across different clusters (Langley & Abdallah, 2011; Stake, 1995). In line with the research question, theoretical sampling criteria were applied (Eisenhardt, 1989). The starting point was the aim to understand how Western MNCs adapt their value chains to capture new market segments with Frugal Innovations. In order to do so, 18 cases from Western MNCs that developed Frugal Innovations for emerging and developing markets were identified and compiled. Case selection was based on the following criteria, which all firms in this study fulfill: The firms had to have 1) their headquarters in a Western market. All companies 2) had to be multinational operating firms that have already established themselves in the premium or high-tech market segment and they needed to be 3) manufactures of products that maintained a complete value chain. Lastly, 4) the products had to fulfill the frugal criteria according to the definition of Zeschky et al. (2014). Even though this is not the focus of this investigation, all firms generate value from the respective Frugal Innovations presented here.

5.2.2 Data collection

For the collection of the data, semi-structured interviews were conducted with experts identified by the firm. All interview partners were directly involved in the respective projects and were based either at the headquarters or at local subsidiaries. The interview guide was send to the interview partners in advance to ensure that they could prepare accordingly. This provided us with in-depth insights of the structures and processes associated with Frugal Innovation in the respective company. Whenever possible, (Gibbert et al., 2008; Jick, 1979) the interview data with multiple interviews in each firm were triangulated, and the findings were validated and complemented with internal company documents and publically accessible secondary data when available. This allowed to improve data quality and to extend the findings (Gibbert et al., 2008). Overall, 38 interviews were conducted, which lasted between 45 - 100 minutes. Below, Table 9 provides an overview of the case firms and interview partner.

Case (Location)	Company description (# Employees, global)	Product description	Target market	Interviewee role (Interview No.)
ApplicManu (EU)	• Globally leading firm in home appliances • Several global & local brands • Several subsidiaries globally (>60.000)	Low cost off-grid conditioner for resource-constrained customers. Evaporation to cool goods	Africa	• VP Corporate Innovation Alliances (1)
MedDiag1 (EU)	• World leading manufacturer of optical systems & medical devices • Launched a dedicated a emerging markets strategy • R&D centers in India & China (>29.000)	Ophthalmic device with simple functionality & high quality standards at entry-level price. Earlier reliable detection of eye diseases	India & China	• Senior Director Sales Rapidly Developing Economies • Product Manger India • Global Program Manager • Product Manager China (4)
Agricult1 (EU)	• Manufacturer of agricultural engineering equipment • Production facilities in India • Portfolio of emerging markets products (>11.000)	Combine harvester (track), tailored to requirements of rice growing regions, improved grain quality	India	• Product Manager (2)

InfoTec (USA)	• Solution provider of connected commerce products and services for the banking & retail industry • Recently opened new plant in India (>9.000)	Self-servicing ATM customized to local market requirements predominately in India	India	• Senior Product Manager (1)
MedDiag2 (USA)	• MNC with a healthcare technologies segment (e.g. medical imaging, diagnosis, screening) • Early entry into lower & middle income segments for healthcare products (increasing portfolio) (>300.000)	Anesthesia-delivery system that displays critical patient data during surgery. Dependable, intuitive & affordable delivery.	India, China, ASEAN, Africa	• Product Manager (1)
Agricult2 (EU)	• Provider of widest product range in agricultural vegetable machinery (e.g. seeding and harvesting) • Local subsidiaries in 15 countries incl. Asia • Machines sold in over 120 countries (>2.000)	Small-scale potato planter (highly efficient) developed for India, offers simultaneous planting & fertilizing catering to local needs	India	• Product Manager • Country manager South-East Asia (2)
MechEng1 (EU)	• Leader in advance pump solutions. Products are sold in more than 50 countries. • Expansion & acquisitions so far have mainly focused on North America and Europe. (>18.000)	Water pump system with dispenser, robust, simple functions, high ease of use, high reliability, low maintenance requirements	Kenya, Tanzania & Uganda	• Business Development • Business Manager Africa • Director Global Partnerships • Product Manager (4)
MechEng2 (EU)	• Globally leading manufacturer of pack-aging solutions • More than 80 subsidiaries worldwide (>5.000)	Affordable, entry-level packaging machine for automated production, of plastic packs. Country-specific customization	Global	• Area Sales Manager South & South-East Asia (1)

MechEng3 (EU)	• A leading operating technology provider for yarn processing • Focus of machinery and components (>4.000)	Twisting machine for automated manufacturing of stable fiber. Basic functionality customized to needs of resource-constrained customers	India, China & Indonesia	• Head of R&D (1)
IndusTech1 (EU)	• Globally leading supplier in the wire manufacturing industry • Several subsidiaries in China and Japan focusing on marketing, sales and service. • Recent acquisition of a Chinese competitor (>2.500)	Low-cost stripping machine for cables, new external sheeting material & internal components reach lower costs, fewer functions, simpler operation with touch	Global	• Head of New Technology • Product Manager (2)
MedDiag3 (EU)	• Leading healthcare MNC in imaging, laboratory & point-of-care diagnostics • R&D centers & production facilities in China and India (>350.000)	Affordable & flexible entry-level X-ray solution with basic functionality. Easy & safe operation- Primarily sold in emerging markets.	Global	• Head of Product Management (1)
MedDiag4 (EU)	• Specialized manufacturer of medical imaging solutions • Global network of own subsidiaries and distribution partners • Approx. 60% of revenues from export (>500)	Mobile C-arm for orthopedics applications with compact footprint. Sold to small-scale clinics in emerging markets.	China	• Director Global Marketing • Product Manager (2)
IndusTech2 (EU)	• Global leader in industrial technology in electrification, automation & power grids. • Extensive operations in more than 100 countries. (>140.000)	Low-cost exhaust-driven turbocharger, customizable platform, high reliability, more efficient workflow and greater ease of use for local staff	China, Indonesia & Philippines	• Head of R&D • Head of Safety • Head of Production Development & Support (3)
MechEng4 (EU)	• Leading firm in industrial food processing technologies	Low-cost, compact maize mill, mobile, more manual process steps,	Sub-Saharan Africa	• CTO • Head of Corporate

	• International presence operating in over 140 countries and a long standing history of products for all segments beyond high-tech (emerging & developing markets) (>10.000)	robust, packaging is also used as housing of mill, lower capacity, ease-of-use for first time millers		Technology India • Head of Innovation Lab • Project Engineer • Project Manager • R&D Process Manager (6)
Manufact (EU)	• Solutions for mobile living travel in climate, hygiene & food • 22 manufacturing sites globally, selling products in 100+ markets (>6.000)	Ethanol fueled stoves, simple functionality, cheap, durable, environmentally friendly	Mozambique, Tanzania & Kenya	• Head of Division Developing World Products (1)
MechEng5 (EU)	• Active in piping systems, machining & automotive. • M&A in 80`s with a competitor in China (Joint venture) • Value chain partly located in China • Early insights into emerging markets (>14.000)	Low-cost die-sinking machine, limited functions & greater ease of use, very robust design & high reliability, more efficient workflow	China & South East Asia	• Head of R&D (1)
IndusTech3 (EU)	• Leading systems & service provider for polymer-based solutions • Global network of sales & distribution • Production sites in Asia and Africa (>19.000)	Micro-biogas application, mobile, robust & highly reliable materials, intuitive use and functions	Tanzania & Kenya	• Head of Corporate Strategic Development • Head of International Business Development • Head of Strategic Technology Management (3)
EnergEquip (EU)	• Internationally leading solution provider for electronic systems. • Factories, R&D & marketing in South-east Asia (>600)	Low-cost EMC filter, lower safety standards, less certification, no customization options, local components	China	• Head of Product Management • Head of Development Center (2)

Table 9: Overview case firms

5.2.3 Data analysis

For each case, a detailed case history was written based on the validated transcripts and additional secondary data. After Eisenhardt (1989), the data analysis followed a two-step process. In the first step, two researchers analyzed the case data independently in an iterative manner switching between data and emerging themes (Mayring, 2007; Locke, 2001; Miles & Hubermann, 1984). This step was proceeded by a cross-case analysis (Eisenhardt, 1989) to identify common and divergent patterns. These patterns were matched in tabular form (Miles & Hubermann, 1984). In order to achieve a consistent pattern, various iterations between the cases, literature and the findings were made. The value chain, build on Porters famous graphical illustration (Porter, 1985), was divided into 8 different segments (see Figure 10), to allow for proper and detailed analysis. Here for each segment it was evaluated whether the activities were either specifically adapted ('Made-to-measure'), a combination of established and new ('Hybrid') or regular ('Off-the-shelf').

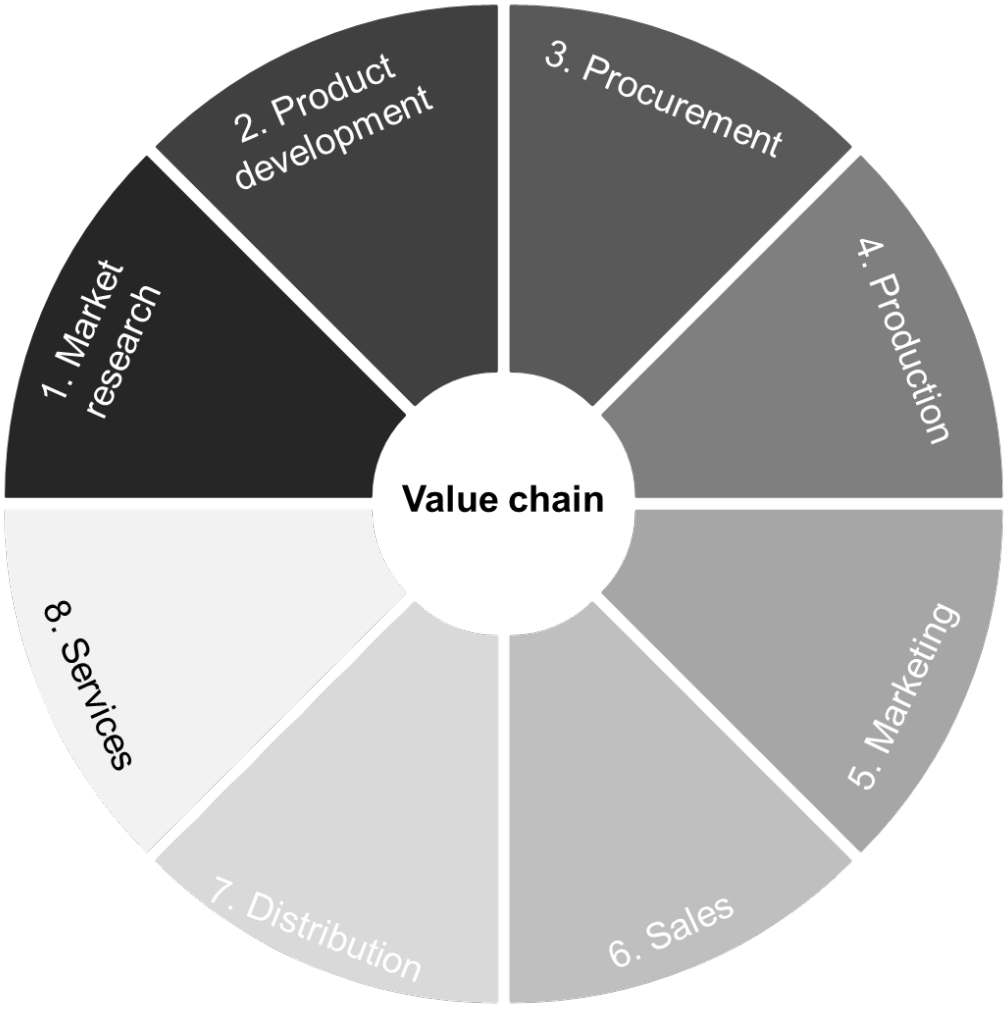

Figure 10: Overview value chain segmentation

5.3 Findings

The examined cases of Frugal Innovation were investigated with regard to their product characteristics and adaptions made to the value chain activities. Different degrees of application innovation were identified on the product level. Moreover, the analysis of value chain activities illustrated that companies relied on either their standardized, established processes or on customized, sometimes radically new approaches to Frugal Innovation. Finally, it was found that even though all companies had a strong low-cost focus, significant differences with regard to localization were identified. In a subsequent step, these findings were aggregated on an individual firm-level along three criteria: 1) degree of application innovation, 2) value chain customization, and 3) degree of localization. This systemization led to the identification of three distinct clusters, applying either ‘Made-to-measure’, ‘Hybrid’ or ‘Off-the-shelf’. ‘Made-to-measure’ describes the approach were firms set-up the structures and processes completely new. ‘Hybrid’ describes a combination of new practices and established ones. ‘Off-the-shelf’ represents the established structures and process that firms apply in all their activities.

5.3.1 Cluster 1: ‘Made-to-measure’

Companies in cluster 1 (IndusTech3, ApplicManu2, MechEng1, MechEng4, MechEng5) developed Frugal Innovations with a very high degree of application novelty and utilized primarily customized approaches along the entire value chain (see Figure 11). In addition, high emphasis was placed on intense collaboration with partners and customers in combination with a high degree of value chain localization. Social value creation represented a critical part of the business model for three out of the five companies in this cluster. All companies had to meet customer requirements that differed fundamentally from their home (-established) markets. The companies in this cluster followed the most radical approach to capture the new customer segments. For the market research, companies in this cluster applied an intense and highly collaborative approach. The high intensity and granularity require significant human, financial, and time resources. The firms wanted to gain an in-depth and a multi-dimensional market understanding and consequently involved local stakeholders (e.g. expert interviews & collaborative local teams) and potential customers from the beginning of the process (e.g. field test, home-use-test, rapid prototyping). These effort lead to solutions that differed largely from the existing portfolio in almost all aspects. For the product development process, specifically composed and dedicated R&D

teams were responsible, which enjoyed high degrees of organizational freedom, diversity, and mobility as well as a global footprint. Simultaneously, they were able to access all resources within the firm and further consult external partners whenever necessary (e.g. engineering solution provider) in the process. In some cases, new R&D units were founded. All teams share an entrepreneurial mindset that allowed for an explorative trial-and-error approach with numerous on-side trials. Nevertheless, this approach is very resources consuming. This approach implies a fluid connection between market research and development. In the next step, procurement, firms in this cluster fostered close relationships with existing suppliers and vetted new options, if the new solution required it. In most cases, the firms approached their suppliers with their concepts and cost structures at an early stage to ensure proper integration and feasibility. The overall target here was to ensure cost discipline and account for the specific requirements. This approach was often selected, if the solutions required components that were not standardized in the current portfolio. Great emphasis was placed on geographical proximity of procurement and production. Most of the companies based their production activities in low-cost markets (e.g. China, India or South-east Asia). Additionally, established production infrastructure was integrated into the process to create synergies wherever possible. Another aspect was the securing of intellectual property rights for key components of the product. This allowed reducing the investment and risks involved. Assembly of the products was mainly focused on the target markets or regions, which enabled firms to benefit from low-cost labor and increased flexibility in many cases. This approach resulted in significant cost savings and potentially increased margins. Looking at marketing, sales, distribution and services, all firms in this cluster relied on specifically tailored approaches to harness their potential in the markets fully. Strong emphasis was put on local focus in cooperation with local partners that help to facilitate a successful integration. Each step and activity was adapted to the local environment of the customer. In many cases, this was achieved by assigning significant autonomy to the local market organizations. Local people play the key roles in when it comes to all activities connected to the target market.

Cluster 1	**Product**	**Value chain configuration**								
Case firm	Degree of application innovation	Market research	Product development	Procurement	Production	Marketing	Sales	Distribution	Services	Degree of localization
IndusTech3	High	✂	✂	Ø	Ø	✂	✂	✂	✂	High
ApplicManu2	High	✂	→←	Ø	Ø	✂	✂	✂	✂	High
MechEng1	High	✂	→←	Ø	Ø	✂	✂	✂	✂	High
MechEng4	High	✂	✂	→←	Ø	✂	✂	✂	✂	High
MechEng5	Medium	→←	✂	→←	→←	✂	✂	✂	✂	High

Figure 11: Cluster 1 (✂ = 'Made-to-measure'; →← = 'Hybrid'; Ø = 'Off-the-shelf')

5.3.2 Cluster 2: 'Hybrid'

The second cluster (ApplicManu1, MedDiag1, MedDiag2, Agricult1, Agricult2) offered products with a moderate degree of application novelty (see Figure 12). Along the value chain, both customized and standardized approaches were combined. In addition, partner and customer involvement as well as localization were less emphasized compared to the first cluster. Finally, the creation of mutual social value in the investigated cases was less pronounced. Overall, these companies engaged in a medium approach towards Frugal Innovation combining established and new approaches as well as activities. Firms in this cluster exhibited a strong combination of established and new approaches in their market research activities. They leveraged external expertise (e.g. university collaborations, market reports, partner companies & customers) as well as internal company knowledge to create thorough understanding of the needs and requirements of their potential customer. External knowledge was used mainly to detail the solution characteristics or verify assumptions of the team. Firms that chose this approach had often limited prior experience or presence in the desired target markets. In this cluster, the companies followed an overall standardized and linear development approach that was very much home-based in established R&D units either in Western markets or locally, if present (e.g. China or India). To stay close to the findings from the market research phase relevant personnel from different departments was incorporated and some limited customer feedback was included. In many cases, local experts were consulted along the process. The procurement approach for cluster 2 relies mainly on existing supplier and structures and was localized in few cases only. New suppliers were chosen, if existing could not meet requirements or quantities. Many firms in this cluster followed the example of firms in the first cluster and localized their marketing, sales, distribution and services. Great emphasis was placed on 'Made-to-measure' approaches for each new market. Nevertheless, simultaneously attempts were made to leverage global (or at least regional) synergies and to uphold corporate standards. Some firms resorted to 'Hybrid' practices using established sales and distribution channels or offer standard services.

Cluster 2	**Product**	**Value chain configuration**								
Case firm	Degree of application innovation	Market research	Product development	Procurement	Production	Marketing	Sales	Distribution	Services	Degree of localization
ApplicManu1	Medium	✂	→←	→←	Ø	✂	✂	✂	→←	Medium
MedDiag1	Medium	✂	✂	Ø	Ø	✂	→←	→←	✂	Medium
MedDiag2	Medium	✂	→←	Ø	→←	✂	✂	✂	Ø	Medium-Low
Agricult1	Medium	→←	→←	Ø	→←	✂	→←	✂	✂	Medium-Low
Agricult2	Medium	→←	→←	→←	Ø	✂	✂	✂	✂	Medium

Figure 12: Cluster 2 (✂ = 'Made-to-measure'; →← = 'Hybrid'; Ø = 'Off-the-shelf')

5.3.3 Cluster 3: 'Off-the-shelf'

The third cluster (IndusTech1, IndusTech2, MechEng2, MechEng3, MedDiag3, MedDiag4, EnergyEqui, InfoTec) developed innovations with a comparably low degree of application innovation and mainly applied standardized value chain activities (see Figure 13). The focus was on adjusting the product characteristics rather than the business model. Additionally, these eight companies hardly cooperated with local partners and barely involved customers in critical activities, such as market research. The localization of value chain activities was low, as main responsibilities were kept in the headquarter and operations in the west. Finally, excellent knowledge of customer requirements within the company combined with a medium degree of technical novelty of the Frugal Innovations were key features of the companies within this group. Cluster 3 exhibits an incremental approach towards Frugal Innovation. In terms of market research, these firms relied heavily on established structures and practices (e.g. customer feedback & sales experience. These practices were well established in earlier projects, centered on data analysis and monitoring. The generated insights were complemented with overall market trends and informal market validation (e.g. local stakeholder). By acting this way, firms were much quicker in their market research process; however, the final solutions were less disruptive to the new market as compared to the first and second cluster. For product development, procurement and production, the eight firms relied on established structures and processes, which were adapted to fit the results from market research. Were possible local procurement and production was used to stay close to the market and to potentially reduce cost and leverage local cost advantages. Marketing and sales were in most cases driven by a 'Hybrid' of established and new activities to incorporate local requirements. Distribution was executed in similar or existing structures as the regular portfolio. For unserved markets, a regional partner for distribution was identified. Services relied mainly on standardized global models and were adjusted to local needs in some cases.

Cluster 3	**Product**	**Value chain configuration**								
	Degree of application innovation	Market research	Product development	Procurement	Production	Marketing	Sales	Distribution	Services	Degree of localization
IndusTech1	Medium	Ø	→←	→←	Ø	→←	Ø	→←	Ø	Low
IndusTech2	Medium	Ø	→←	→←	→←	→←	→←	✂	✂	Low
MechEng2	Medium	→←	→←	Ø	Ø	→←	Ø	Ø	Ø	Low
MechEng3	Medium	→←	Ø	→←	→←	Ø	→←	Ø	→←	Low
MedDiag3	Medium	→←	✂	→←	→←	→←	Ø	Ø	Ø	Low
MedDiag4	Medium	Ø	Ø	Ø	Ø	→←	→←	Ø	→←	Low
EnergyEqui	Medium	→←	→←	→←	→←	→←	→←	→←	✂	Low
InfoTec	Low	→←	→←	Ø	→←	→←	→←	→←	→←	Low

Figure 13: Cluster 3 (✂ = 'Made-to-measure'; →← = 'Hybrid'; Ø = 'Off-the-shelf')

5.4 Discussion

This study has identified three clusters applying either the ‘Made-to-measure’, ‘Hybrid’ or the ‘Off-the-shelf’ approach. ‘Made-to-measure’ describes the approach were firms set-up completely new and customized structures and processes for their value chain activities. ‘Hybrid’ describes a combination of established (standardized) practices and new (customized) ones. The ‘Off-the-shelf’ approach represents firms that rely on established structures and process in almost all of their activities. Each of these approaches is the result of the case firms in their attempt to meet the customer needs in new (middle- or low-income) market segments in emerging and developing markets. The various effects and implications in the context of extant literature are discussed below.

5.4.1 From products to solutions

Existing literature on resource-constrained innovation in most cases has taken a product perspective, focusing on singular aspects such as the product itself or market research (e.g. Zeschky et al., 2011; Altmann & Engberg, 2016; Sharma & Iyer, 2012). However, a central finding of this study is that regardless of the cluster, the effects of resource-constrained innovations go beyond the product. They have consequences for all value chain activities; more specifically affect the value chain as a whole. Similar ideas have been presented earlier such as Winterhalter et al. (2017), who discuss the central element of business model innovation in the context of Frugal Innovation. The results of this study highlight the role of different aspects of the value chain and the interplay among them. In many cases, the business model is adapted to accommodate market needs, as for example the revenue model (e.g. payment plans) or offering (e.g. additional services) are changed. Therefore, resource-constrained innovation should not be studied solely from a product perspective but rather holistic, incorporating the value chain as well as the business model. This suggests that it would be worthwhile to move from studying products to studying solutions.

5.4.2 Progressive approach

Even though it has been shown that resource-constrained innovations affect the entire value chain, the approach between the clusters varies considerably. Some firms tailored nearly all their value chain activities (‘Made-to-measure’), others changed only parts or build on existing structures and processes (‘Hybrid’), whereas some firms did adapt very few or relied on exclusively on existing activities (‘Off-the-shelf’). The results shows that firms can take a progressive approach and do not necessarily

require the most radical change in their business practice as indicated in earlier studies to capture new customer segments (Landau et al., 2016; Winterhalter et al., 2016; Zeschky et al., 2011). The cases show that the decision-making process for either approach was determined by a combination of company, market or product characteristics. For the company, factors such as degree of market experience and reliance on established knowledge were key indicators. A high degree of reliance on established knowledge resulted in 'Off-the-shelf' approaches, whilst low market experience and low reliance on established knowledge led to 'Made-to-measure' approaches. Existing market experience and medium level of existing knowledge resulted in 'Hybrid' approaches. These insights add to findings by Neumann et al. (2017), where it was shown that the absence of market experience requires more adaptations concerning knowledge transfer, which demands changes of value chain activities. External market factors such as customer needs (degree of divergence to Western customers) and the local conditions (e.g. institutional voids, insufficient business and/or public infrastructure) determine the degree of adjustments. Customization ('Made-to-measure') was more prevalent, if the degree of product novelty was high, with medium relying on 'Hybrid' approaches and low on standard 'Off-the-shelf'. These findings are in line with earlier studies that proposed a negative effect of standardization and the affordability of a product (Ernst et al., 2015). Overall, the findings suggest that firms can choose a progressive approach concerning this type of innovation. For example, the choice of customer or market segments in combination with other internal and external factors indicate what approach or degree of adaptations is required.

5.4.3 Localization of value chain activities

The cases in this study exhibited varying degrees of localization in their value chain activities. In contrast to earlier studies, that promoted the localization of significant proportions of value chain activities as central to success (Brem & Wolfram, 2014; Corsi et al., 2014; Winterhalter et al., 2017; Zeschky et al., 2011), it has been shown that in practice this varies depending on the firms approach. Firms in cluster 1, which followed a radical approach where many activities as well as responsibilities were transferred to the respective target market or region. These firms, similar to cluster 2, focus on localization in key activities such as market research, marketing, sales, distribution and services, which are the areas were intimate customer knowledge is central (Winterhalter et al., 2017; Zeschky et al., 2011). Yet, in line with arguments of Altmann & Engberg (2016), the findings indicate that the Western R&D center plays a

central role for core technologies and as a sparring partner in cases of difficult knowledge transferability. The cases in cluster 3 show that local knowledge and feedback can be achieved through mechanisms other than localization. Yet, it appears that the degree of application innovation is medium or low and thus less disruptive in the target market. A central finding of this study is that it is important to differentiate between local knowledge and local embeddedness. Not local knowledge, but rather the local embeddedness is the key foundation of customer and market understanding. Earlier research (Ansari et al., 2012; Ernst et al., 2015; London & Hart, 2004) has already indicated the importance of local embeddedness to some extent. This clarifies how some firms were able to generate the required customer and market insights, without being present in the market itself, with many value chain activities. The firms that exhibit a low degree of localization compensated with extensive knowledge and experience in their target market (local embeddedness). They found ways to leverage longstanding and close relationships with local stakeholders (e.g. customer, business partners or suppliers). In contrast to this, firms with limited or no market experience leveraged value chain localization to gain insights regarding customer and market understanding. Their presence was then used as a foundation to build local embeddedness in the long-term. Wherever possible, firms aimed to leverage synergies, for example in procurement and production, to streamline efficiency and use existing resource. Here, the most cost-effective solutions were chosen in terms of availability and proximity to the target region. As indicated in most publications on this matter, cost reduction was a central objective across all firms (Dunning, 1993; Ernst, 2006; Lewin, Massini, & Peeters, 2009). In all cases, a strong headquarter involvement was given in terms of strategy, management and decision-making. This was attributed mainly to the novelty of the targeted customer and market segments.

5.4.4 Stakeholder and customer interaction

One key element that is always referred to with this type of innovation is close collaboration with stakeholders and customers (e.g. Seelos & Mair, 2007; Winterhalter et al., 2016). This recurring pattern has also been shown in this study, across cases. Three main knowledge gaps are the drivers for this phenomenon: (1) customer (2) market and (3) technology. Firms in cluster 1 established very close collaborations with their customers and local stakeholders (e.g. firms, NGOs & institutions) and involved them along the entire value chain. Some even outsourced complete activities such as market research, marketing, sales or service. This is in line with findings from earlier studies that showed similar activities in their cases (Seelos & Mair, 2007; Webb

et al., 2010; Winterhalter et al., 2016). Cluster 2, again, showed a mixed picture, which diverts from literature findings, stakeholder and customers were integrated in early phases (e.g. market research and/or procurement or in the last-mile (e.g. sales and/or service). Firms in cluster 3 reverted less to this option, as many had established strong local embeddedness through for example joint ventures or sales representations. One could argue that the close collaboration was in place prior to the project launch, already. Overall, the more radical the approach chosen by the company was, the closer were collaborations with external stakeholders and customers. It can be argued that close collaboration with local stakeholder and customers is a critical success factor.

5.4.5 Limitations

This study aims to answer some of the open question regarding the emerging phenomenon of resource-constrained innovation. Yet, typical limitations of qualitative research (case study based) apply to this study (Eisenhardt & Graebner, 2007). As in many cases, one of the largest limitations is the limited case number and the generalizability. Nevertheless, to rule out other explanations to our results we selected the 18 MNC cases very carefully in regards to type, industry, target market and innovation. Considering this is the first attempt to study the adaption of value chains in Western MNCs and that some discrepancies to extant literature were identified it seems promising to intensify future studies in this direction.

5.5 Conclusion

The shift of economic power towards Asian and African countries forces Western MNCs to change their ways of doing business. Existing structures and processes are no longer viable when targeting resource-constrained customers in emerging and developing markets. Thus, firms need to adapt their activities in order to be successful. Our study provides new insights on how firms adapt the value chain activities to capture new customers in lower- and middle-income segment in emerging markets. The present studies has identified three distinct clusters ‘Made-to-measure’ (radical), ‘Hybrid’ (moderate) or ‘Off-the-shelf’ (incremental), which vary in degree of application innovation, value chain customization and degree of localization. By identifying these, the study was able to develop some novel findings as well as conceptual insight, which will add to the on-going discussion in this field and stimulate new research projects.

6. Conclusion

6.1 Overall summary

This thesis investigates how (Western) companies manage innovation that target resource-constrained customers in middle or lower income segments in emerging and developing markets. For this, the presented research draws on discussions in innovation, international business and strategy research, building on original data. Based on this foundation, empirical evidence is provided that allows to shed light on several questions surrounding the discussion of resource-constrained innovation. Despite this field of research seeing activity for almost two decades, the discussion in academic publications is still at a stage that focusses on theoretical discussions (based on recurring cases) and exploratory research. Thus, the perspective and scope of this thesis contributes to a better and deeper understanding of this contemporary discussion. Additionally, this thesis explores how firms (Start-ups, SMEs & MNEs) need to manage, organize and adapt their business activities to capture resource-constrained customers in new market segments successfully. Lastly, the articles presented in this thesis add new perspectives to the ongoing scholarly debate. This thesis studies the following aspects: Paper A investigates the consequences and implications of market choice and the role of disruption. Four distinct clusters are introduced to understand the relationship between activity focus (value chain vs. solution) and effect on the market (low-end disruption vs. new-market disruption. Paper B examines the transfer of knowledge in the context of Frugal Innovation. In this study, the in- and outflow of knowledge along the phases of the value chain creation process is shown, depending on the firm's prior market activity (Active vs. Non-active). The third article, Paper C, discusses the role and allocation of autonomy as a tool to manage strategic duality by looking at Western MNCs that innovate for resource-constrained customers in Asia, Africa and Latin America. Lastly, Paper D offers insights into the adaptations to the value chain activities in Western MNCs aiming to capture customers in new market segments in resource-constrained environments. Here, the detailed changes are addressed and the firms' changes were shown. Based on a rich qualitative data set the four research articles in this thesis provide insights that further advance the discussion in management research, as well as the work of practitioners, which allows them to be more successful in the endeavor to capture new customer and market segments.

6.2 Implications for literature and future research opportunities

6.2.1 Implication for theory

Even though this field of research has been studied for nearly two decades, so far predominantly from a theoretical and qualitative perspective, many promising research avenues for future research remain. Up until now, most articles on resource-constrained innovation have taken a product-perspective and are based on qualitative, often anecdotal cases but rarely connect to existing theoretical discussions. To advance research in this field, this thesis has taken first steps to investigate underexplored research questions. Each paper is based on real-life cases, which are used to explore new phenomena that follow research avenues identified in earlier studies. Paper A has explored and added to the discussion around disruption/disruptive innovation and the implications of market choice. Further, Paper B studies the transfer and management of knowledge adding to a growing body of literature. So far, very little is known about this topic, especially in the context of lower and middle-income customer segments of emerging and developing markets. Paper C is among the first to carry the discussion around HQ and subsidiary relationship, specifically autonomy into the emerging and developing markets sphere. In this article, it is shown how autonomy is a management tool for firms to deal with the strategic duality of simultaneously serving customers in the high-end as well as middle- and lower-income segments. So far, these aspects have been largely excluded in leading strategy publications. In the last article, paper D, for the first time adaptations to the value chain activities of firms entering new market segments were investigated. This perspective offers an interesting new lens for literature on resource-constrained innovation and business practices in and for emerging market segments.

For future research in this field, many interesting and worthwhile research avenues remain untouched until now. Overall, the discussion needs to move away from typologies and theoretical definitions. There are two important next steps to advance this discussion and cement its relevance in the academic community. First, a closer link to current theoretical discussions needs to be established. There are some publications that already link discussions around resource-constrained innovation and emerging market segments to theories such as ambidexterity or like in this thesis autonomy and headquarter subsidiary relationships. Further promising connections could be created with e.g. absorptive capacity or the literature on attention-based-view. However, the majority of publications is still lacking this crucial connection. Consequently, many lingering questions remain unanswered. Secondly, more

research projects need to focus on quantitative data, as these are almost entirely absent. Here, it would be worthwhile to quantify and measure success factors, cost of development, value chain activities, sustainability effects and many more. Another important aspect would be the differentiation of existing and future results regarding firm type (start-ups, SMEs and MNEs). This could assist to create results that are more applicable for each type of firm. These insights would be helpful to the ongoing discussion in theory and among practitioners. Another field that is missing systematic and empirical investigation is the local environment of these new markets and their actual effects on business practices of business. This would trigger a whole discussion about collaboration with and integration of local partners in these endeavors. Findings from this realm would be of value in the ongoing discussion around localized and globalized business practices in which the tension between complexity and efficiency is central. Lastly, it would be very important to reignite the discussion surrounding Reverse Innovation and the applicability of practices and activities for emerging markets to established market segments. Over the last year, the customer and consequently their consumption behavior has changed, which requires firms to adapt their activities even in established markets. Studying the questions introduced above and of course others will further both the theoretical but also the practical understanding significantly. Answering these questions offers great opportunities for research to move forward in a productive manner.

6.2.2 Implications for management practice

Apart from the theoretical implications, the four papers in this thesis offer numerous implications for practitioners and management practice in general. Building on established frameworks and typologies, this thesis provides first practical insights in areas that have not been explored in a systematic and empirical manner so far. Overall, this thesis offers very specific guidance for managers ranging from strategy formation, to the product/service development process, over the entire value chain activities all the way to the respective solution arriving at the customer. Insights regarding market choice and its implications are introduced. Further, best practices of how knowledge is and needs to be transferred within the firm are studied, as well as the management of autonomy in firms facing the strategic duality of serving established customer segments and entering new ones. Lastly, it is shown how companies from various industries adapted their value chain activities in order to successfully innovate for resource-constrained customers. Research investigating resource-constrained innovation/customers, new market segments, as well as

emerging and developing markets is and will be predominantly driven by real-life activities of businesses. The decision of firms to engage in this field will determine the direction of this academic discussion. Consequently, any open questions that are relevant for practitioners resulting from their activities are very much the epicenter for future research projects. Based on the results of this thesis, some central questions that seem particularly worthwhile studying in order to advance the discussion emerged. What industries and markets will dominate the resource-constrained innovation discussion? What are specific methods and tools that firms can apply to be most effective? What is the ideal organizational set-up to capture new market segments successfully? How can firms manage the strategic duality of multiple customer segments in the long-run? How does the respective culture factor into the activities of a firm? Can established best practices and best practice cases stand the test of time? What are the (qualitative) metrics behind resource-constrained innovations? What role does digitization play in this context? Researchers, consultants, and practitioners are very much encouraged to investigate these increasingly relevant questions.

7. References

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