



**Technology and  
Innovation Management**  
at Hamburg University  
of Technology

## Working Paper

# The Deliberative Frugal Mindset – A Model of Managerial Opportunity Recognition for Frugal Innovation

Malte Krohn\*, Finn Petersen, Dustin Hochmuth, Cornelius Herstatt

January 2020

Working Paper No. 109



**Hamburg University of Technology (TUHH)**

**Institute for Technology and  
Innovation Management**

Am Schwarzenberg-Campus 4  
D-21073 Hamburg

Tel.: +49 40 42878 3777

Fax: +49 40 42878 2867

Malte.david.krohn@tuhh.de

[www.tuhh.de/tim](http://www.tuhh.de/tim)

\*corresponding author

## Abstract

The importance of growing economic powerhouses like India and China is increasing. Consequently, cost effective products and services and therefore, Frugal Innovations provide attractive business opportunities for globally operating companies. However, not all organizations seem to recognize these opportunities for what they are. The question arises if key decision makers have the right mindset to initiate and support respective innovation projects within their organizations. We take on our previous research on the Frugal Mindset and present the results of two recent studies to further develop our theory. In our first study we generate items based on the Theory of Planned Behaviour by conducting a systematic literature review of 95 publications and validate as well refine this approach in a focus group discussion with 16 experts on Frugal Innovation. Consequently, we test our research instrument for practicability, comprehensibility and further refine the items in a small scale pilot study including 8 follow-up interviews with managers from 2 multi-national companies. Based on this procedure we present a research model, a measurement instrument and first qualitative insights on the Deliberative Frugal Mindset.

Keywords: Frugal Innovation, Frugal Mindset, Deliberative Frugal Mindset, Opportunity Recognition, Theory of Planned Behaviour, TPB

---

## 1 Introduction

The global marketplace is getting ever more dynamic and economic realities are changing quickly. Three developments are particularly interesting for our discussion: global socio-economic shifts, respective changes in consumer demands and new companies that become increasingly effective in catering these demands. While global markets remain highly interdependent, the importance of growing economic powerhouses like India and China increases (Ernst and Young, 2015). However, not only geographical shifts in the economy can be observed. Economic developments within these regions result in a growing importance of middle-class consumers on the global scale. It is estimated that by 2030 two thirds of the global middle class will be from the Asia-Pacific region, which used to be one third in 2009 (Ernst and Young, 2015). A situation that has led to great interest in popular media like *The Economist* (see e.g. (Wooldridge, 2010)) and academia, for example in the discussion around the bottom of the economic pyramid (BOP) (see e.g. (Prahalad,

2006)). With average income levels far below the levels of European countries or the US, this middle class has different expectations with regards to the balance of price and value when it comes to products and services (Ernst, et al., 2015). In the Nielsen New Product Innovation Survey Report, affordability was the number one reason to buy new products among over 30.000 participants from 60 countries around the globe (Nielsen, 2015). 43% of global consumers even suggested that there should be more affordable new product introductions. While a variety of similar concepts, such as BOP Innovation (Prahalad, 2006), grassroots innovation (Gupta, 2013) or reverse innovation (Immelt, et al., 2009) provide theoretical lenses to analyse this phenomenon, Frugal Innovation (FI) seems to become one of the most frequently applied approaches (Agarwal, et al., 2017). FIs are defined as offerings that cost significantly less than comparable solutions while focusing on core functionalities and providing a performance level, which is optimized for the given use context (Weyrauch & Herstatt, 2016).

Combining both perspectives of changing consumer demographics and resulting needs as well as new innovation approaches, like FI to develop respective “good-enough” products, might result in attractive global business opportunities. In management literature, opportunities characterize situations “in which new goods, services, raw materials, markets and organizing methods can be introduced through the formation of new means, ends, or means-ends relationships” (Eckhardt & Shane, 2003). The opportunities that FIs offer are increasingly targeted by new local players in emerging markets (Ernst, et al., 2015), which might become a challenge for established companies in the future (Zeschky, et al., 2011). Huawei, Taobao, M-Pesa and Narayana Health provide impressive examples for these young, fast growing ventures. These developments arguably have implications for various actors in the interconnected global marketplace, globally operating multi-national companies (MNCs) being especially confronted with these dynamics. However, MNCs often seem to ignore the opportunities provided by targeting cost conscious customers with affordable solutions that fit local needs (Prahalad & Hart, 2002). Countries like Germany seem particularly interesting to investigate this phenomenon because the economic landscape is characterized by national initiatives like the High Tech Strategy (see: (BMBF, 2018)) and world leading players in technology driven industries like machine building and automotive. National German media has already reported that German machines might be too good to be successful in fast growing emerging markets (Welt, 2013). For German MNCs that often focus on market segments in which customers are willing to pay a price premium for high quality products (premium markets), the described economic developments almost inevitably create tensions.

Taking a closer look on these companies however, it is important to keep in mind that organizations do not recognize opportunities, but its members do (Krueger, 2007). We would like to take on Krueger’s (2007) proposed focus on key individuals to understand the process of opportunity recognition within organizations. Hence, the question arises why specific situations in the FI context are recognized as opportunities by “organizational entrepreneurs” or not? Hence, we draw on literature from the fields of FI and the advanced theoretical foundations of entrepreneurial opportunity recognition to shed light on this phenomenon. This rationale is supported by previous empirical research, which has shown that “soft” behavioural dimensions like senior management involvement and a globalization focused innovative company culture impact international new product development performance (De Brentani & Kleinschmidt, 2004). More specifically, case study research on the development of a FI called Tata Swach (an affordable water purifier) has shown that a committed leader that is convinced of the opportunities for FIs can have a catalysing role through behaviours like allocating vital resources, providing vision and legitimizing the radical cost reduction focus of a project (Ramdorai & Herstatt, 2015). Ramdorai and Herstatt (2015) provide comprehensive insights on the crucial championing role and supportive behaviours of leadership in a disruptive innovation project focusing at the bottom of the pyramid. However, the study remains relatively silent on the cognitive antecedents of the leadership behaviour in focus. Why was the opportunity for such an innovation recognized by Tata’s leadership? Further studies encourage the importance of such commitment for the development of FIs. Reinhardt et al. (2018) developed a low-end innovation capability framework from literature review and case study insights. Within this framework the authors subsume FI as one low-end innovation

perspective and identify low-end culture and commitment as one crucial capability. Reinhardt et al. (2018) define this as “the capability to create and maintain an organizational environment that supports low-end innovation.” Since culture reflects shared assumptions that an organization has developed to indicate appropriate ways to identify and deal with issues as well as opportunities (Schein, 1985), we argue that low-end culture can be understood as a collective Frugal Mindset (Krohn & Herstatt, 2018) and commitment might be regarded as an behavioural outcome of that very mindset. Fayolle et al. (2011) intensify this rationale with the suggestion that commitment might be the link that is missing to describe the intention-behaviour relation in entrepreneurship research.

We believe that “digging deeper” into the cognitive antecedents of innovative behaviour of key decision makers in affected organizations is very promising to investigate why MNCs might not always recognize the opportunity provided by FIs. While scholars have suggested that individuals in organisations need to change their mindset (Zeschky, et al., 2011) and develop a “Frugal Mindset” (Soni & Krishnan, 2014) the discussion remains rather conceptual. To the best of our knowledge, no publication attends a more theory driven approach that allows for in-depth explanation of the concept or subsequent testing. Based on our previous effort to frame the phenomenon, we recall that a Frugal Mindset might be important for managers, marketing as well as R&D staff alike and all of these might provide valuable insights (Krohn & Herstatt, 2018). However, we believe it is most promising to first develop a better understanding of high-level decision makers and first empirical insights from an ongoing action research project support this assumption (Krohn & Buse, 2019). On one hand the recognition of opportunities and thus innovation must not necessarily happen “top-down” but can emerge from motivated

employees all over the organization. On the other hand, management support and providing vision and resources for innovation was found to be crucial to facilitate innovative employee behaviour (De Jong & Den Hartog, 2007) and might consequently create an organizational culture that supports FI. Furthermore, top-level managers who communicate and act upon their entrepreneurial strategic vision, will likely affect the organization’s cultural attributes and support the formation of cultural norms favouring entrepreneurship, which might consequently reinforce organizational members’ commitment to that very vision (Ireland, et al., 2009). This enabling role of committed senior management has also been stressed in the specific context of international new product development performance (De Brentani & Kleinschmidt, 2004), FIs (Ramdorai & Herstatt, 2015) and has been suggested as a prerequisite to implement a firm-wide Frugal Mindset (Angot & Plé, 2015). Thus, we suggest that understanding the cognitive orientation of decision makers towards FI opportunities is crucial in understanding why some MNCs might ignore opportunities to cater the bottom of the economic pyramid with affordable solutions that fit local needs (Prahalad & Hart, 2002).

We will follow Krueger’s (2007) suggestion and built on the foundations of entrepreneurial opportunity recognition, which is grounded in the Theory of Planned Behaviour (TPB) (see (Ajzen & Fishbein, 2005)) for a comprehensive review). This well-developed theory shows robust empirical evidence and has been found to have high potential to explain the recognition of emerging opportunities in the context of entrepreneurship and innovation (Krueger, 2007). In the next chapter, we will discuss in more detail why the TPB (Ajzen, 1991) and its application in entrepreneurial opportunity recognition (Krueger, 2007) could also provide a

deeper understanding of managerial behaviour in the case of FI.

In order to develop our emerging theory and a respective model of managerial opportunity recognition for FIs and prepare for subsequent quantitative analysis, this contribution will conduct several steps. Following a theory driven approach to measurement scale development (DeVellis, 2016), we apply a standard development process from management research (Turker, 2009) summarized in Figure 1.

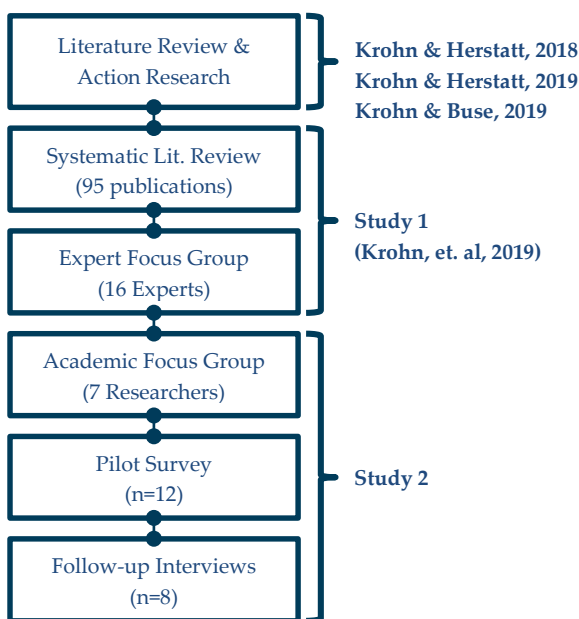


Figure 1 - Research Process. Source: Own Representation

First, we will discuss our current understanding based on Krohn and Herstatt (2018), Krohn and Herstatt (2019) and Krohn and Buse (2019). Secondly, we will discuss a study, which is based on a systematic literature review of 95 publications relevant to FI and a focus group with 16 experts, practitioners and stakeholders of FI in Germany (Krohn, et al., 2019). Study 1 provides us with a promising theoretical model and specific items to test the recognition of opportunities for FI. Subsequently, we present the results of a Study 2<sup>1</sup>, which is a pilot study as discussed by Van Teijlingen and Hundley

(2002). Here, we assess the feasibility of our research instrument and collect preliminary qualitative data from managers in two German MNCs. Finally, we will discuss the implications of our findings and avenues for further research.

## 2 Theoretical Background

As discussed before, our model will build on the theoretical foundations of the TPB. The TPB originated from the field of social psychology and suggests that intentions, which are a function of attitudes towards a behaviour, perceived social norms and perceived behavioural control, are credible predictors of actual succeeding behaviour and its closest cognitive antecedent (Ajzen, 1991). The theory is particularly interesting because it has been successfully applied in empirical studies to predict entrepreneurial behaviour and was consequently found to have the potential of studying the emergence of complex economic behaviour prior to actually observable action (Kautonen, et al., 2013).

### 2.1 Attitude, Intention and Behaviour

Several approaches to the prediction of behaviour can be found in the literature. While attitudes, which were previously defined as a complex multidimensional construct containing cognitive, affective and behavioural aspects (Rosenberg & Hovland, 1960) play a central role in this discussion, individual behaviours were found to be influenced by the social environment and feasibility considerations, too (Ajzen & Fishbein, 2005). These will be discussed in more detail later on. Consequently, the predictive power of attitudes on behaviour is limited. One possible approach to avoid the effect of these additional factors is the principle of aggregation. By aggregating a large number of behaviours and a general attitude towards the domain of interest the additional factors can be

<sup>1</sup> Study 2 is accepted for and will be presented at the 27<sup>th</sup> Innovation and Product Development

Management Conference in Antwerp, Belgium, June 8-9, 2020.

neglected (Ajzen & Fishbein, 2005). Alternatively, Fazio's (1990) MODE model incorporates specific situational factors, such as current cognitive capacity to increase the predictive accuracy of general attitudes on specific behaviours. The TPB however considers intentions to be the closest cognitive antecedent to actual behavioural performance (Ajzen & Fishbein, 2005). Here, specific attitudes towards a behaviour rather than general attitudes towards a domain of interest or object are assessed. This requires the principle of compatibility, which means that measures of attitude and behaviour involve the same action, target, context, and timeframe, which can be specified on a more specific or general level (Ajzen, 1988). In our case, the principle of aggregation could result in an investigation of general attitudes of decision makers in MNCs towards markets with cost conscious consumers (an object) in all areas of an organisation and its correlation to a set of relevant behaviours. If we would follow the principle of compatibility in a more specific way, we could investigate attitudes of German senior R&D managers towards committing resources to projects aiming to develop and commercialize FIs within the next six months (a behaviour). Arguably, the principle of compatibility could also be applied in a less specific way.

As we will discuss later, the TPB has already been applied to empirically investigate issues of complex economic behaviour and could consequently be used to understand why in some cases senior management commits to support FI projects as discussed by Ramdorai and Herstatt (2015). Therefore, we will now discuss the theory in more detail and in the specific context of opportunity recognition.

## **2.2 Theory of Planned Behaviour and Opportunity Recognition**

Before organizations innovate, individuals need to perceive a given situation as an opportunity rather than a threat (Krueger, 2007). Krueger

suggests that the recognition of opportunities depends mainly on the perception of individuals and stresses a better understanding of these cognitive phenomena. Opportunity perceptions in turn are suggested to be an intentional process that is driven by perception of feasibility or controllability and by perceptions of desirability (Krueger, 2007). A lack of this perception might then lead to the recognition of a threat instead of an opportunity. In the domain of entrepreneurial opportunity recognition, the TPB has been suggested as a theory-driven conceptual framework that has the potential to explore and predict these potential barriers to entrepreneurial activity (Krueger, 2007). Scholars successfully applied the TPB in different contexts of entrepreneurship, such as Entrepreneurial aspiration and transition into self-employment in Britain (Henley, 2007) and the prediction of entrepreneurial behaviour in Finland (Kautonen, et al., 2013). However, the model is not limited to individuals operating outside of organisations. Krueger (2007) also suggests that it allows to explain why and how phenomena such as champions operate and thus indicates a strong compatibility with established innovation management perspectives. Indeed, research has been published in *The Journal of Product Innovation Management* in which the TPB has been applied to investigate management perspectives on virtual customer integration in new product development (Bartl, et al., 2012). This is arguably a matter of recognizing the opportunity of integrating new technological possibilities into existing organizational processes. Furthermore, Jimmieson et al. (2008) utilize the TPB to explain employee intentions to support organizational change.

So, how does Ajzen's (1991) TPB handle the perceptions of desirability and feasibility and a subsequent intention to perform an action? In the TPB framework, intention is a function of three variables. Firstly, a cognitive orientation

towards the behaviour that either result in a favourable or unfavourable evaluation (attitude), secondly a perception of the evaluation of the social environment to perform the behaviour (subjective norm) and perception of the ease or difficulty to perform the behaviour (perceived behavioural control (PBC)) (Ajzen, 1991). A possible noteworthy extension of the model for entrepreneurial behaviour in organisational contexts is the perception of collective efficacy (Krueger, 2007). Since people do not live their lives in individual independence, many of the outcomes they seek are only attainable through collective efforts (Bandura, 2000). This is especially relevant when we consider the dynamic organisational environments of MNCs. Individual beliefs in the collective ability to produce desired results are an important component of such collective agency (Bandura, 2000). While including this perspective into our investigation might be challenging because much work is still to be conducted within this domain (Bandura, 2000), it offers opportunity to advance practical as well as theoretical knowledge (Krueger, 2007). In summary, organizational decision makers need to perceive a potential course of action as feasible, personally desirable, and in accordance with social norms to recognize it as an opportunity (Krueger, 2007).

We believe that the TPB bares great potential to further explore why decision makers might recognize the potential opportunity of FIs or not. Now, we will discuss the conceptual links to our previous work.

### 2.3 The Frugal Mindset and the Theory of Planned Behaviour<sup>2</sup>

Mindsets remain a “fuzzy” concept in managerial literature, because several different conceptualisations exist (French II, 2016). Hence, mindset scholars suggest to clearly define the prevailing conceptualization and locate it in academic literature (French II, 2016). We followed this call in our previous efforts to provide more clarity regarding the Frugal Mindset phenomenon and applied Gollwitzer’s (1990) mindset theory of action phases (Krohn & Herstatt, 2018; Krohn & Herstatt, 2019). This allowed to identify important FI directed goals (i.e. setting strategic direction for FI, developing in-depth market knowledge and subsequently development of respective frugal solutions) (Krohn & Herstatt, 2018). Furthermore, we were able to divide the individual behavioural process of pursuing such goals into the tasks of goal setting, planning and action taking as proposed by Gollwitzer (1990). The respective task specific mindsets again vary along the different phases of goal-oriented behaviour (i.e. decision-making focused deliberative mindsets and planning as well as action focused implemental mindsets) (Gollwitzer, 1990). Hence, we proposed to clearly distinguish between a decision making relevant Deliberative Frugal Mindset and an action oriented Implemental Frugal Mindset (Krohn & Herstatt, 2019). As discussed before, we believe that the perspective of high level decision makers is particularly interesting. Thus, we will focus on the operationalization of the perception of desirability as well as feasibility of FI opportunities as conducted in the Deliberative Frugal Mindset.

<sup>2</sup> The conceptual integration of our previous work and the TPB has been presented in a doctoral consortium at the research workshop “Cognitive Perspective in Entrepreneurship Research: Past, Present, and Future” in Paris in

September, 2018. Here, supportive feedback was attained from Icek Ajzen and Norris Krueger and a best PhD project price was awarded to the main author.

While Gollwitzer's (1990) theory suggests the assessment of the desirability and feasibility of the behaviour as the central aspect for the deliberative mindset and hence in the decision making stage, it does not provide details about the processes of this assessment. As discussed in the previous section, this can be complemented by applying the TPB. Indeed, first empirical work combines both theoretical lenses to develop a better understanding how entrepreneurial intentions translate into actions and it suggests that the later phases of goal attainment are more volitional than motivational in nature (Delanoë-Gueguen & Fayolle, 2018). In this context, it is important to discuss the differences between attaining a goal in Gollwitzer's (1990) work and performing a behaviour. Ajzen and Fishbein (2005) suggest that intentions are immediate antecedents of behavioural performance but not goal attainment. The authors argue that actual goal attainment might not only depend on a person's behaviour but also on external factors out of a person's control. Actual behavioural control thus varies depending on the context (Ajzen & Fishbein, 2005). We would like to apply this thought to our discussion of the Frugal Mindset. For example, the manager of a business unit might be convinced that launching a new product for price sensitive customers in India will result in a profitable business, is compatible with the company's vision and the manager might also be confident that marketing and R&D have the skills to come up with a suitable solution. Committed to finding a course of action towards that goal, the manager might then find out that critical R&D staff would prefer to work on projects that advance the organizations technological competitiveness rather than having a closer look at the actually needed technological performance. The manager's FI supportive behaviour might not translate into achievement of the goal of developing FIs. Nevertheless, we argue that behavioural control over personally setting a certain goal (deliberation) even in a complex organizational context is high and thus can be explained with the TPB, similarly to studies of entrepreneurial opportunity recognition. Therefore, we expect our theoretical lense to be promising to operationalize the Deliberative

Frugal Mindset and we can advance in our process as shown in Figure 2.

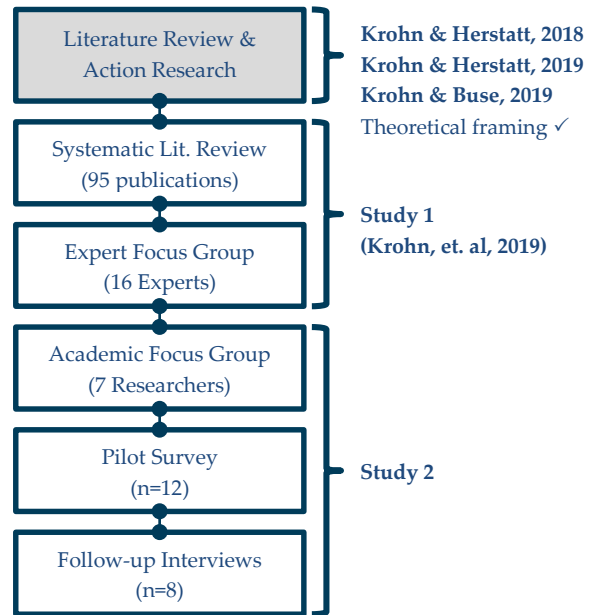


Figure 2 – Theoretical Framing. Source: Own Representation

In the next chapter, we will discuss further conceptual work on managerial opportunity recognition for FIs based on the theory of planned behaviour.

### 3 Conceptual Development

In the field of entrepreneurship, relevant beliefs regarding attitudes, perceived social norms and perceived behavioural control are already explored and empirically tested. Entrepreneurial intentions of individuals are investigated by assessing factors like personal autonomy, self-realization and security (Kautonen, et al., 2013). To the best of our knowledge, for FI critical aspects that could influence managerial perceptions of desirability and feasibility of FIs are not investigated and consequently require further research.

To develop a reliable measurement tool that builds on the theoretical foundations of TPB research, Ajzen (2002) suggests that pilot work is required to identify underlying beliefs of the research population. These beliefs are crucial in the TPB because they are assumed to provide a



cognitive and affective foundation of attitudes, subjective norms and perceived behavioural control (Ajzen, 2002). Therefore, identified beliefs can provide measures of these constructs. Furthermore, Ajzen and Fishbein (2005) suggest that measures for attitudes towards behaviours should contain instrumental (e.g. desirable-undesirable) and experiential (e.g. satisfying-unsatisfying) items. Perceived behavioural control builds on the confidence of performing a behaviour on the one hand and the extent to which an individual has control over a behaviour on the other hand (Ajzen & Fishbein, 2005). In our context further measures should then assess, if an individual is confident that other organizational members are able or willing to perform the activities not in her or his hand. The specific aspects that represent and determine these three constructs need to be defined.

Following the call to include more context specific factors to studies based on the TPB, Bartl et al. (2012) also included market orientation, managers innovativeness and their position within the organisation to explain behavioural intention besides the three established antecedents to intentions. However, the factors covered by the TPB explained 68% of variance in behavioural intentions, whereas the extended model only explained one additional percent of variance (69%). Contrary to these findings Marcati et al. (2008) report that a model based on general and specific innovativeness was a much better predictor of innovative behaviour for entrepreneurs in SMEs than a model based on the TPB. Arguably, a deviation from the well-established and tested model should be justified by potentially increasing its explanatory power.

Finally, literature suggests to carefully determine the level of specificity of investigated behavioural intentions (Ajzen & Fishbein, 2005; DeVellis, 2016). For example, we could investigate if decision makers intend to increase the budget for innovation projects characterized

by offerings that are concentrated on core functionalities, an optimized performance level and significant cost reduction (Weyrauch & Herstatt, 2016) significantly within the next 6 months, a rather specific intention. Contrary, we could ask if decision makers intend to initiate or support projects rather focusing on customers with a low willingness to pay at some point in the future, which is much more general.

Hence, three points need to be further refined to develop a context specific model to investigate if decision makers in MNCs actually recognize the opportunities of FI suggested in the academic discussion and actually intend to act on them:

1. Does the specific context of FI require further background factors beyond the TPB specific aspects of attitude, social norm as well as behavioural control? If so, what aspects need to be included and what is the resulting research model?
2. What is a reasonable direct measure for behavioural intentions to support and initiate FI projects be operationalized?
3. What are context specific behavioural beliefs that can be applied to operationalize the perceived desirability and feasibility of FI opportunities?

We suggest that questions 1 and 2 can be answered by conceptual considerations and will be discussed in the remainder of this chapter. However, question 3 requires more extensive research and will thus be answered in Study 1, which is presented in Chapter 4.

### 3.1 Background Factors

Regarding the first question, Ajzen and Fishbein (2005) discuss and propose various background factors that have been incorporated in TPB studies to develop a deeper understanding on the formation of beliefs, such as emotions, education or prior behaviour. We believe prior behaviour to take a particularly important role for our study. Ajzen (2002) suggests that if a stimulus situation is unchanging, there is little

reason for behaviour to change. Then, prior behaviour is a reliable predictor of later behaviour (Ajzen, 2002). But what if the environment is characterized by significant change? Arguably, the situation in which many, especially Western, organizations are with regards to FI is one that is not stable. Consequently, decision makers might form their intentions based on beliefs that were formed in response to previous experiences. This rationale would then explain why many MNCs don't see the opportunities provided by the BOP (Prahalad & Hart, 2002) on the level of individual managerial cognition.

But how can this gap between our representation of the environment and the actual situation be explained? The confirmation bias is a concept investigated by scholars from cognitive and social psychology that might clarify the gap between beliefs that are held and the actual situation (Nickerson, 1998). Antons and Piller (2015) also draw on this approach to explain the negative position that many organizational members take when it comes to accepting knowledge from outside of the organisation, the "Not Invented Here Syndrome". Borkovec (2002) summarises respective research and proposes that prevailing beliefs can alter processing of newly available information. Several possible explanations for the mechanisms behind the formation of such a bias are provided by Nickersen (1998). He proposes that people can treat evidence in a biased way when they are motivated by the desire to defend beliefs that they wish to maintain, once one has taken a position on an issue, one's primary purpose becomes that of defending or justifying that position. People might do so by consciously or subconsciously seeking information that is supportive of an existing hypothesis or belief. Also, they sometimes appear to give more weight to information that is consistent with a hypothesis (Nickerson, 1998).

We recall that Gollwitzer's (1990) deliberative mindset is characterized by cognitive tuning toward information relevant to the issues of goal feasibility and desirability, orientation toward accurate and impartial processing of such information and open-mindedness or heightened receptivity to information in general. The mechanisms discussed by Nickersen (1998) could potentially influence these processes. In that regard, a confirmation bias of the existing innovation strategy, might be induced by previous experiences of a decision maker and prevent the formation of a Deliberative Frugal Mindset. A bias towards high-end market segment focused innovations, as found by Reinhardt et al. (2017) might be the result.

Ajzen (2002) consequently, suggests that researchers could include a measure of prior behaviour into their research to improve its predictive power. Carr and Sequeira (2007) follow this suggestion and test the influence of prior family business exposure on the formation of entrepreneurial intentions. Indeed, their results suggest significant positive effects of prior family business exposure on the antecedents to the formation of entrepreneurial intentions.

Following this interesting perspective and its empirical confirmation in a related field, we hypothesize that:

H1: Managers' previous exposure to innovation activities focused on premium market segments are negatively related to the attitude to support FI projects.

H2: Managers' previous exposure to innovation activities focused on premium market segments are negatively related to the perceived social norms regarding the support of FI projects.

H3: Managers' previous exposure to innovation activities focused on premium market segments are negatively related to the perceived behavioural control to support FI projects.

### 3.2 Direct Measure of Intention

Another open question is the direct measure of intentions to support or initiate FI projects. We recall that: "A single behavior can be viewed as involving an action directed at a target, performed in a given context, at a certain point in time." (Ajzen & Fishbein, 2005). Applying Ajzen's guidance to our situation, we will build on Ramdorai and Herstatt's (2015) findings and consider provision of resources for FI projects, legitimization of the radical cost focus of FI projects and provision of vision for FI projects of decision makers as important behavioural actions. In more general terms, we will investigate intentions to support FI on an operational, tactical and strategic level. Consequently, the target of these actions would be the development of FIs. The context are companies headquartered in Germany that rely on successful business operations in key emerging markets. Finally, because we investigate different levels of support (operational, tactical, strategic) that potentially require different time horizons, we will not predefine the time of these activities specifically.

Since intentions are considered to be the closest cognitive antecedent to actually observable behaviour (Ajzen & Fishbein, 2005), care needs to be taken that the intention items have high internal consistency (Ajzen, 2002). Ajzen (2002) suggests that it is necessary to select appropriate items in the formative stages of a study and several different items may have to be applied to reflect the single behaviours under investigation.

As we discussed before, previous studies have already shown that leadership behaviours like allocating vital resources, providing vision and legitimizing the radical cost reduction focus of a project can have a catalysing role in FI (Ramdorai & Herstatt, 2015). For our work, we will take these three perspective of strategic support (i.e. providing vision), tactical support (i.e. allocating resources) and operational

support (i.e. cost-focused decisions in actual projects). Following Ajzen's (2002) recommendation, we will formulate different items for the pilot study and test for internal consistency. This results in the following list of items for the direct measure of intentions:

Strategic perspective:

- I am planning to incorporate FIs as a substantial part of our innovation strategy
- I intent to support the integration of FIs in our company's product portfolio
- I am planning to use FIs as a key opportunity for growing our business operations

Tactical perspective:

- I will allocate sufficient time and financial resources to my employees to work on FI projects
- I am planning to allocate substantial financial and personnel resources for the execution of FI projects in my budget
- I intent to establish a team for the development of FIs

Operational perspective:

- I intent to support our employees proactively in the development of FIs
- I have specific ideas for FI projects and I am planning to actively integrate these into our innovation activities
- I will participate in pushing the progress of FI projects in the day-to-day business

While conceptual work allows us to develop a promising extension of the model for our context and define a purposeful direct measure of behavioural intention, further research is needed to provide specific items to predict the underlying constructs. This is now discussed in Study 1.

## 4 Study 1 - Underlying Beliefs<sup>3</sup>

As previously mentioned, Ajzen (2002) suggests pilot work to develop a reliable measurement tool. We followed a two-step approach to identify relevant beliefs to operationalize attitude, perceived social norms and perceived behaviour control regarding the support of FI initiatives.

### 4.1 Methodology

Firstly, in order to gain an objective understanding of aspects that influence underlying beliefs regarding FI, the methodology of a systematic literature review (SLR) has been applied. This methodology has been found to be well suited to investigate issues in management research (Tranfield et al. 2003). SLR is a concept-centered method that is useful for the "identification and evaluation of the underlying concepts used" (Fisch & Block, 2018). It offers a structured, replicable and transparent method that aims to improve the quality of literature analysis and minimize bias (Tranfield, et al., 2003) and is often considered to be best-practice for the analysis of large samples of literature (Mallett, et al., 2012).

Secondly, we conducted a focus group with 16 practitioners, experts and stakeholders from the field of FI. Focus group discussions have been shown to generate a deep understanding of a phenomenon (Breen, 2006) and can "clarify, extend, qualify or challenge data collected through other methods" (Gill, et al., 2008). Hence, focus groups have been found to be especially effective in research when used in combination with other data collection methods (Masadeh, 2012).

Following the suggested procedure of Tranfield et al. (2003), the methodology uses a multi-stage process. In the first step, a review protocol

defines search terms, databases and search functions for the identification of relevant literature. This protocol is then applied to identify relevant literature to create the sample. Consequently, the output is checked for fit and quality in an iterative selection process and the database is finalized. Following the initial stages, the literature is analyzed in a series of coding steps to extract insights for the research question (Pratt, 2009).

We recall that in this stage of our research we aim to identify factors that potentially influence the formation of beliefs regarding FI and consequently the decision-making towards FI projects. This analysis takes place within the theoretical framework of the TPB introduced by Ajzen (1991) and the action-phase model for mindsets established by Gollwitzer (1990).

We defined the following criteria for inclusion of identified studies for our SLR:

1. The Study discusses innovation concepts similar to FIs (at least two of three criteria defined by (Weyrauch & Herstatt, 2016) apply).
2. The Study states factors that are potentially relevant for the decision-making towards respective innovation projects, including managerial implications.
3. Information stated is relevant to the predecisional phase and therefore Deliberative Frugal Mindset (Krohn & Herstatt, 2019)

Agarwal et al. (2017), Agnihotri (2015) and Zeschky et al. (2014) identified a large number of terms that are applied for innovations in the context of scarcity conditions. Literature on these so-called constraint-based innovations has experienced remarkable growth but created a

the identified factors were operationalized into an actual questionnaire.

---

<sup>3</sup> This chapter is mainly based on the findings of our previous study (Krohn, et al., 2019). Further conceptual work resulted in the final model and

fragmented mass of terminology (Agarwal, et al., 2017). Because of the fragmented research in the field of innovation concepts with strong overlap between different concepts, several search terms had to be defined to include as much relevant information as possible. Innovation concepts, that are being used in the proximity of FIs were identified and analyzed. The analysis investigated whether the concept share at least two of the stated criteria for FIs (selection criteria 1 of the review protocol; due to limitations of this paper, we do not present this analysis in this publication). Table 1 summarizes the list of relevant innovation concepts for the study.

Table 1 - List of identified search terms for the SLR. Source: (Krohn, et al., 2019)

Search Terms
"Frugal innovation*"
"Jugaad innovation*"
"Catalytic innovation*"
"Frugal engineering*"
"Gandhian innovation*"
"Resource-constrained innovation*"
"Reverse innovation*"
"Low-cost innovation*"
"Good-enough innovation*"
"Constraint-based innovation*"
"Bottom of the pyramid innovation*"
("disruptive innovation*" AND "emerging econom*") OR ("disruptive innovation*" AND "emerging market*")

The set of search terms was then used for a systematic search of Business Source Premier and the Web of Science. Articles as well as books and conference proceedings, published in English were included in the primary selection. To ensure a high level of relevance and fit,

articles published in or after 2001 from the subject areas of management, business, economics, (industrial) engineering, product development, environmental science, and multi- and interdisciplinary sciences were selected.

The search yielded a total of 361 identified sources. Consequently, an iterative selection process of the identified publications was conducted, using the review protocol criteria. The final database included 95 relevant articles on which a multi-stage coding was conducted (Pratt, 2009). Figure 3 shows a graphical representation of the process until that point.

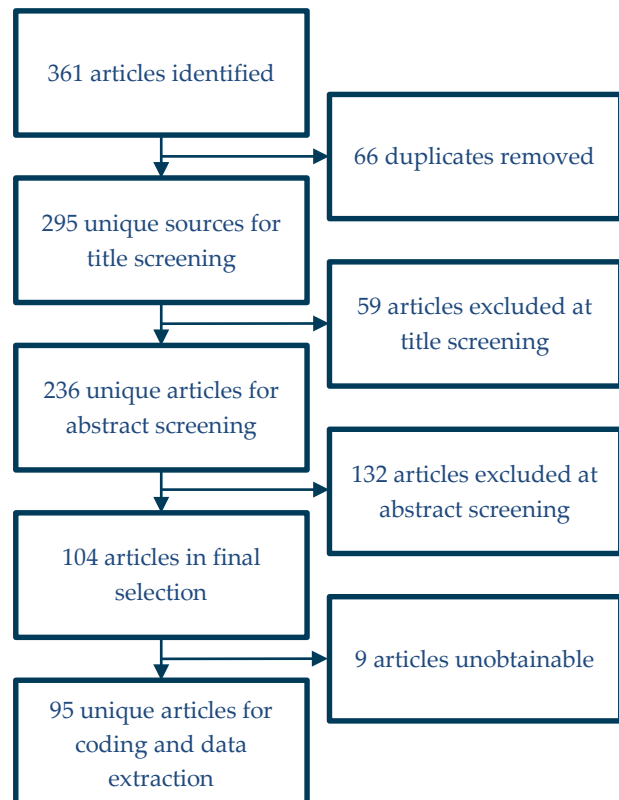


Figure 3 - Literature Selection Process and Final Database. Source: (Krohn, et al., 2019)

The first coding stage was used to link information and text passages from the literature sample to the concepts of the theory of planned behavior by using a concept matrix (Webster & Watson, 2002). Consequently, similar items from the first stage of coding were aggregated into individual factors according to their overarching concepts in the second coding step (Mays, et al., 2005). Finally, the factors were

grouped into key influencing factors in the third stage of coding

Furthermore, in order to validate and complement the previously identified key factors as well as the applicability of the theory of planned behavior in to our research question, the results of the systematic literature review were discussed with practitioners, experts, and stakeholders of FIs in a focus group workshop. Sixteen practitioners, experts, and stakeholders from the field of FIs participated in the workshop and focus group discussion that lasted for 180 minutes. Participants included a senior research engineer from a large American MNC involved in several FI projects including a popular example for FI in the healthcare sector, engineers from the fields of electronics, renewable energies, and automotive developing FIs or active in emerging markets, researchers engaged with FIs, and members of public agencies concerned with the support of (frugal) innovation in Germany.

The discussion in the focus group showed that the participants fully supported the model of the TPB and were in many cases intuitively able to link personal experiences to the categories, which describe and influence the intention building process. The participants agreed with the general framework (“want” - attitude, “shall” – perceived social norms, “can” – perceived behavioral control), the influencing factors on the initiation of FI projects, which were identified in the SLR, and found the factors to represent important aspects that have an impact on FI projects in organizations from a practical perspective.

A workshop protocol was documented and the notes as well as workshop outputs were consequently clustered by a team of three researchers from the Institute for Technology and Innovation Management to summarize the discussion results. This complemented the factors from the literature review and strongly

supported the chosen theoretical lense of our study.

## 4.2 Results

The full-text analysis and coding of the sample of 95 studies resulted in the identification of 26 items that might be relevant to the decision making regarding FI. More specifically, we identified 9 factors for the individual attitude, 4 different stakeholders of FI projects, and a total of 11 predictors for the perceived behavioral control to support FI projects. The results from the focus group fully supported the previously identified factors from the literature as well as the applied framework for the intention building process. Furthermore, one factor (Regulatory Environment) was added to the results and one factor was adapted (Strategic Orientation of the Firm) during the focus group discussion.

We will now discuss our findings. Notably, the number of studies that mention specific factors are stated for illustration purposes and must not be interpreted as a quantitative analysis of the data, but can give a first indication of the perceived relevance of the factor in the literature.

### Personal Attitude

The analysis of the literature sample identified several potential influencing factors on the attitude of individuals towards FI projects. The personal attitude is influenced by economical as well as social aspects that are associated with FIs. Analysis of the sample suggests both positive (benefits) and negative (disadvantages) aspects of supporting FI projects.

### Opportunity to create economic value

A fundamental benefit of FI projects is the opportunity to create economic value for companies, which is suggested in 60 of the 95 of the analyzed studies. Successfully developed FIs have the potential to create access to new markets (Prahalad, 2006), (Govindarajan, 2011) (Farooq, 2017) (Ramdorai & Herstatt, 2017)

(Janda, et al., 2018) and thus, are frequently seen to offer significant growth opportunities for companies through gaining access to a large group of new potential customers (Ray & Ray, 2010) (Banerjee & Leirner, 2014) (Hossain, 2018).

### **Creation of social value**

However, not only economic aspects might be influential for the individual attitude on FIs. The creation of social value through development and distribution of FIs is a benefit that is discussed in 26 of the 95 studies in various aspects. Empowering resource-constrained consumers and offering more sustainable products are often linked to FIs and might affect the personal attitude positively (Radjou & Euchner, 2016) (Pisoni, et al., 2018). Offering products that are more closely developed to fit to the actual customer needs and thus improve customer satisfaction also add to the social value that is linked to FIs (Mukerjee, 2012) (Linna, 2013).

### **Organizational benefits**

FI projects have also been found to offer benefits on the organizational level. The process of developing FIs can result in efficiency gains in the innovation process as well as improved organizational learning (Hossain, 2018; Christensen, et al., 2006; Herstatt & Tiwari, 2017). Successful development of FIs often happens under resource constraints and can improve the cost efficiency of the innovation and product development process organizations (Agnihotri, 2015). Development of frugal products requires close collaboration between several departments to ensure a precise shared understanding of customer needs and the target price that needs to be met. These interactions can enhance knowledge transfer and organizational learning in the firm (Angot & Plé, 2015).

### **Recent trend of frugality**

Frugality is also emerging as a trending concept in emerging and developed economies. A

growing feature-fatigue of customers and successful cases of FIs have been found to have a positive effect on a positive perception of FIs by 14 studies of the sample (Immelt, et al., 2009) (Tiwari, et al., 2017) (Leliveld & Knorringa, 2018). Customers from both developed and emerging markets increasingly value products that have fewer features, a good-enough performance for their tasks and are easy to understand (Radjou & Euchner, 2016) (Tiwari, et al., 2017).

Nevertheless, literature also suggests several aspects linked to FI projects that might have an impact on the perception of FIs for individuals. Several factors that might have a negative influence on the attitude towards FI projects on an instrumental or experiential level are discussed now.

### **Complexity and unfamiliarity of FI projects**

In our analysis regarding the perceived behavioral control of supporting FI projects we will discuss that FI can be a challenging endeavor. This might impact the attitude towards supporting such projects. For example, the complexity and long-term commitment required for FI project is discussed as such a challenge in 14 studies from the sample (Andel, 2013) (Shankar & Hanson, 2013) (Altmann & Engberg, 2016) (Zhu, et al., 2017). Furthermore, organizations have to invest considerable time and resources into understanding the actual customer needs that the frugal product has to address. Overall unfamiliarity with such a holistic undertaking is another factor that might negatively influence the personal attitude (Adegbile & Sarpong, 2018) (Janda, et al., 2018) (Kaplan, 2012).

### **Fear of product cannibalization**

Ten sources also identify that a fear of frugal products cannibalizing the existing product portfolio of firms which might hinder initiation of FI projects (Immelt, et al., 2009) (Winter & Govindarajan, 2015) (Janda, et al., 2018). This

aspect is closely linked to a potential fear of brand dilution that is identified as a reason for resistance against FI projects, especially by the marketing department.

### **Market conditions of target markets**

FIs are often linked to emerging markets. Nine studies in the sample regarded respective unfavourable market conditions like corruption, high bureaucracy and the pirating of intellectual property (IP) in target markets as an argument against FI projects (Ray & Ray, 2010) (Bhatti, et al., 2013) (Mazieri, et al., 2017).

Although this factor is not specific for FIs but relevant for all emerging market-oriented innovation processes, this factor has been suggested in the literature multiple times and is thus recognized as an influence on the personal attitude of individuals.

### **Lower profit margin of frugal products**

Because frugal products cater volume markets and are often offered in very price competitive markets lower profit margins might be the result. This resulting lower total profit margin on individual products is mentioned as a negative aspect of FIs by seven of the 95 studies of the sample (Lim, et al., 2013) (Corsi, et al., 2014) (Ramdorai & Herstatt, 2017).

### **Perceived Behavioral Control**

The degree to which individuals perceive to have control over an action is another aspect from the theory of planned behavior that influences the formation of an intention to perform a certain behavior. In order to identify what variables influence the perceived behavioral control over the success of FI projects in firms, perceived challenges of such projects were identified in the literature analysis. Such challenges in organizations potentially reduce the confidence of individuals that FI projects are achievable in their firm and therefore reduce the chance of developing the intention to support a

FI project. Eleven FI specific challenges have been identified.

### **Lack of target market knowledge and established partnerships**

An in-depth understanding of the market and respective customer needs are essential for the successful development of FIs and 35 of the analyzed studies name establishing established collaborations with local innovation partners as a key challenge for FI projects (Zeschky, et al., 2011) (Hang, et al., 2015) (Hart, et al., 2016) (Reinhardt, et al., 2018). A lack of established presence in the target market and no market knowledge and understanding itself is discussed in 29 of the studies that were analyzed in the SLR (Chittoor & Aulakh, 2015) (Radojević, 2015) (Simula, et al., 2015) (Aranda-Jan, et al., 2016) (Clark, et al., 2017).

### **Organizational and innovation processes and business measures**

FI projects may require flexible processes to quickly adapt to new findings and requirements for the product in the development process, which results in a challenge when the structure and processes of the firm are rigid and not able to adapt to these requirements, as stated in 32 of the analyzed studies (Leavy, 2011) (Wan, et al., 2015) (Ramdorai & Herstatt, 2017) (Pandit, et al., 2018). (Reinhardt, et al., 2018) developed a capability framework for firms to develop resource-constrained innovations. Their study stated a fast iteration in the development process (quick gathering and processing of information to test new developments faster) to enable FIs (Reinhardt, et al., 2018). This finding has also been shown to be important in the study of (Kaplan, 2012). Furthermore, key performance indicators (KPI) and business measures inherent in these processes that work in disadvantage for FIs are also relevant to that barrier (Hart, et al., 2016) (Radjou & Euchner, 2016). Lastly, a strong dominance of established practices in the firm might additionally be perceived as a barrier for



FI projects (Ahuja, 2014) (Winter & Govindarajan, 2015).

### **Emerging market orientation**

Because FIs are often first introduced to emerging markets, such an emerging market orientation is also discussed as a success factor in 25 studies of the sample (Frigo, 2013) (Borini, et al., 2016) (Pisoni, et al., 2018) (Reinhardt, et al., 2018). Strong indicators for this is if a firm has a low level of integration of local subsidiaries into the value chain and the product development process, no active knowledge exchange between the headquarter and subsidiaries, and a lack of diversity in the development teams for innovations.

### **Entrepreneurial orientation of the firm**

Firms with an entrepreneurial orientation show support for entrepreneurial activity by the management, ambitious targets for FI projects and a portfolio mindset for innovation projects that allows for the existence of riskier projects in the firm (Brown & Anthony, 2011) (Frigo, 2013) (Immelt, et al., 2009). The lack of an entrepreneurial orientation in the organization can consequently be perceived as a challenge for FI projects (Ray & Ray, 2010) (Brown & Anthony, 2011) (Radjou & Prabhu, 2014). This has noted by 20 studies from the sample. A strongly related aspect is a lack of management support for FI projects, which is often linked to a strong risk adversity of managers and stated in 21 of the analysed sources (Borini, et al., 2016) (Pandit, et al., 2018) (Ramdorai & Herstatt, 2017).

### **Strategic orientation of the firm**

As discussed above, the lack of management support can be a serious challenge when implementing FI projects. However, the discussion during the workshop indicated that the framing of "Lack of management support for FI projects" was formulated too narrow to include all relevant aspects and was

consequently expanded to "strategic orientation of the firm". Firms that define themselves as more innovative and value new products highly are found to be more likely to engage with FIs. Various studies additionally suggest that it hinders FIs if sustainability is not a key value in the firm since frugal products are often more sustainable and use fewer resources than traditional products, which can be used as an argument to prioritize potentially more sustainable FI projects (Agnihotri, 2015) (Hyypiä & Khan, 2018). The challenge of innovation itself not being a core part of the firm's strategy has been identified in 14 studies (Anon., 2011) (Corsi, et al., 2014) (Silva, et al., 2018).

### **Organizational ambidexterity**

In today's dynamic business environment, firms potentially need the necessary structures and ability to manage both low- and high-tech products at the same time. If a firm is lacking this ambidextrous capability, this can hinder FIs for firms that are traditionally engaged with premium products (Reinhardt, et al., 2017) (Winterhalter, et al., 2016). Seven sources name a lack of organizational ambidexterity as a challenge for FI projects.

### **Cost focus**

A strong cost focus along the value chain and more specifically the use of information technology in the product development process to decrease costs has been identified in 13 publications as an enabler for FI projects (Agarwal, et al., 2017) (Tiwari, et al., 2017) (Rao, 2017). Being able to establish this capability can thus be perceived as a challenge for FI projects.

### **Total solution development**

(Reinhardt, et al., 2018) and (Corsi, et al., 2014) suggest that developing a total solution for the identified customer needs, which may include enabling access to the product through specific distribution channels, a solution for financing,

improves the success rate for FIs. However, this is a complex endeavor and might impact the perceived behavioral control to support FI projects.

#### **Lack of internal innovation resources**

One publication discussed that firms can lack the internal resources and capabilities to develop innovations and have to externalize and outsource innovation projects (Brown & Anthony, 2011). If this is the case, developing FIs might be perceived as very challenging.

#### **Lack of Frugal Mindset and unsuitable organizational culture**

The importance of a Frugal Mindset and a supportive organizational culture for FIs has been stated in 11 studies of the sample. Valuing simple solutions and low-resource approaches to problems are regarded as an important aspect for the development of FIs in the literature (Zeschky, et al., 2014) (Angot & Plé, 2015) (Radjou & Euchner, 2016) (Hossain, 2018). If such an organizational culture and mindset is missing, it can be regarded as a serious challenge for the successful development of FIs, which is of course the rationale for this study.

#### **Regulatory Environment**

Furthermore, one key factor that was stated during the focus group discussion has not been identified in the literature analysis. This is regulatory influences and established standards and norms that companies have to comply to (mostly in western countries). For example, in Germany these standards often require a high level of technology, which hinders companies to develop FIs. Frequently, firms have already invested into the development of advanced technology levels of their products, and are hesitant to not commercialize the established technology in all of their products.

The focus group participants specifically mentioned that the "High-Tech Strategy" in

Germany (BMBF, 2018). which is initiated by the German government to sustain the German competitiveness and economic growth through the development of high tech technologies, is hindering the development of FIs and is increasing the high tech orientation of employees and companies in Germany. This stands in clear contrast to the "good-enough" approaches that are needed in the development of FIs.

#### **Perceived Subjective Norms**

Furthermore, the professional environment of decision makers in organizations and with that the perceived subjective norms have a strong influence on the formation of intentions by individuals in the workplace (Jimmieson, et al., 2008).

We will now discuss various organizational stakeholders that were identified in the literature review.

#### **Stakeholders of FI projects**

The literature sample was analysed for relevant groups of stakeholders that might influence the formation of an intention to start or support FI projects. Management, R&D, Marketing and Sales are the four main organizational stakeholder groups discussed in the sample. Most notably, 37 of the 95 studies mentioned top management of the company as an important stakeholder regarding FI projects (Ravishankar, 2016) (Reficco & Gutiérrez, 2016) (Shan & Khan, 2016) (Hyypiä & Khan, 2018). Furthermore, the middle management level is discussed as highly relevant for the decision-making towards FI projects by 18 studies of the sample (Brown & Anthony, 2011) (Hossain, 2018) (Sharmelly & Ray, 2018) (Micaelli, et al., 2016). The R&D staff including engineers and product developers have been found to play a significant role for the subjective norms that are perceived in this context (Rao, 2017) (Tiwari, et al., 2017), and are discussed in ten studies. The marketing

department (three studies name the marketing department specifically), as well as the salesforce (stated in two studies of the sample), of companies which are affected by FI projects have been mentioned as relevant stakeholders in the literature sample, too (Zeschky, et al., 2014) (Xu & Xu, 2016) (Hadengue, et al., 2017).

Notably, more examples in the literature expect resistance against FI projects from different stakeholders in the firm. Especially western firms are often suggested to have a strong high-tech-orientation among their engineers which has been proven to negatively affect the decision for FIs in firms (Kachaner, et al., 2011) (Agnihotri, 2015) (Park & Ohm, 2015). In these organizations, the dominant logic is frequently that a new product should have more features than the last generation and the research and development should be performed on the highest level of technology that can be achieved. In such an environment, individuals might be less likely to engage with FIs and build the intention to develop frugal products. Furthermore, Resistance against FI projects is expected from other managers of the firm, if there is risk-adversity, a focus on short-term goals, or managers fear for their authority (Jha & Krishnan, 2013) (Song, et al., 2017) (Song, et al., 2017) (Zedtwitz, et al., 2015) (Tiwari, et al., 2017). Employees from the marketing department are additionally found to associate a fear of brand dilution with FIs when the company is usually expected to offer high-end products (Hadengue, et al., 2017). Another publication identified that lower commissions that result from the lower sales price of frugal products might lead to a resistance of the sales department against FI projects (Govindarajan, 2012).

(Ajzen, 1991) provided a powerful analytical lens to conduct the SLR and the consequent analysis offered valuable insights into factors that might influence the decision-making towards FI projects. These factors have been validated and optimized in the focus group

discussion. In total 9 factors have been subsumed under the attitude towards behavior, 11 factors have been subsumed under perceived behavioral control and 4 stakeholder groups are expected to influence the perception of social norms.

### 4.3 Hypotheses & Research Model

Combining the TPB, our conceptual work and the results of the systematic literature review, we will now formulate further Hypotheses and present our respective theoretical model.

Overall, we found more indicators for perceived advantages of FI and emerging economies are of high strategic importance for many German companies. Additionally, some indicators potentially represent quite strong instrumental advantages of FI, such as access to new fast growing markets and cost optimization along the value chain. We believe that managers in their professional role would strongly consider these aspects in forming their intentions. In line with the TPB we expect that a positive attitude towards FI will have a positive effect on the intention to support FI initiatives and vice versa. Hence, we hypothesize that:

H4: Managers' attitude towards FI is positively related to the formation of intentions to support FI.

In contrast to the many advantages of FI, we identified several organizational stakeholders that might react with resistance to FI projects, such as technology driven development engineers, brand conscious marketers and sales staff with concerns about profit margins. While we expect rather low levels of a supportive social environment, positively perceived social norms should result in higher intentions to back FI projects. Therefore, we formulize the following hypothesis:

H5: Managers' perceived subjective norm is positively related to the formation of intentions to support FI.

Lastly, literature suggests that it is a complex endeavour that requires many specific capabilities (Reinhardt, et al., 2018) and many challenges might result in a conservative assessment of behavioural control. However, if perceived behavioural control is high, we believe this to have a positive effect on the intention to support FI. Hence we hypothesize that:

H6: Managers' perceived behavioural control over FI projects is positively related to the intention to support FI.

Based on these hypotheses and the hypotheses developed in our conceptual work, our research model is presented in

Figure 4, which will serve as a basis for further investigations.

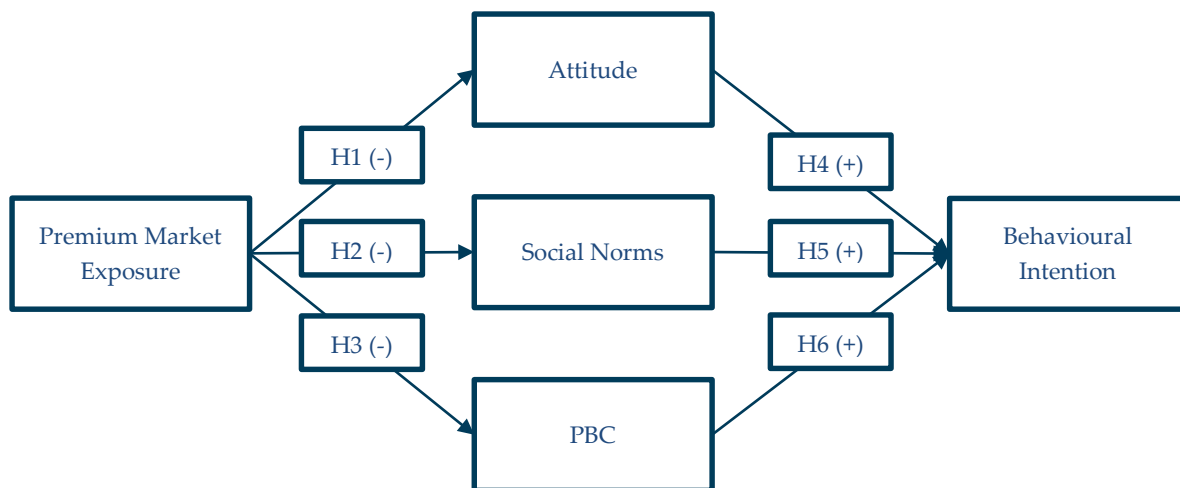


Figure 4 - Research Model Including Research Hypotheses. Source: Own Representation

Generally, we identified more potential negative influences and in line with Prahalad and Hart's (2002) notion, we expect a rather low level of intentions to support and initiate FI projects among managers in German companies.

#### 4.4 Operationalization of model

FI is a rather new phenomenon and quantitative research is mainly absent in the field. Hence, we cannot rely on previously defined measures of our constructs and have to develop a reliable measurement instrument.

Based on the potential items that were identified in Study 1, we conducted several steps to further refine our research instrument and prepare it for a small scale pilot study. This was done in a series of workshops with researchers of the Institute of Technology and Innovation Management as well as an industrial cooperation partner. Several adjustments were made to the initial list of items. The questionnaire was more closely aligned to the

recommendations of Ajzen (2002), wording of items was improved for comprehensibility, control variables were added, scaling was optimized and the questionnaire was slightly shortened based on the feedback from the industrial cooperation partner. Based on these iterations, the questionnaire, which was applied for the pilot study in study 2 was structured as follows.

Based on Ajzen (1991) and the respective guide to building a TPB questionnaire (Ajzen 2002), the questionnaire is divided into 6 parts. Part 1, the introduction, summarizes the key information about FIs in order to ensure the respondents' view on FI matches our theoretical understanding. In part 2, the respondents' *attitude toward the behaviour* is determined. It is divided in questions that are aimed to investigate instrumental aspects (positive influence – negative influence) and experiential aspects (motivating – demotivating). For

example, participants are asked to assess the influence of FIs on entering new markets from very positive to very negative. In total, 13 items assess attitude beliefs. Chapter 3 investigates *subjective norm* regarding FIs. The two sub-chapters assess how a participant rates certain stakeholders interest (*injunctive quality*) and whether support or resistance is to be expected (*descriptive*). For example, participants are asked to assess the expected influence of colleagues from R&D from strong resistance to strong support. This assessment is conducted for all previously identified stakeholders. Part 4 operationalizes the *perceived behavioural control* in the two sub-aspects collective efficacy and personal controllability, closely following Ajzen (2002). The intent to support FI projects is measured in part 5 of the questionnaire by applying the nine items specified in chapter 3.2. For example, participants are asked to assess if the statement “our organization is able to manage low-end and high-end products at the same time” from very false to very true.

Finally, the questionnaire closes with measuring several control variables about the participant and the respective company in part 6. The 6 parts are summarized in Figure 5.

1) Introduction	
2) Attitude Towards Behaviour	Instrumental
	Experiential
3) Subjective Norm	Injunctive
	Descriptive
4) Perceived Behavioural Control	Collective Efficacy
	Controllability
5) Intent to Behave	
6) Control Variables	

Figure 5 - Structure of the Questionnaire. Source: Own Representation

Parts 2-5 apply a 5 point bipolar scoring from -2 to 2 that allows the respondents to answer in a certain range. As a result of the workshops, the subchapters apply different wordings in order to measure the scores. Furthermore, besides rating a series of items representing attitude, PBC and SN, participants are also presented with global measures for the subchapters, which summarize the overall predisposition. For example, participants are asked if they generally expect, resistance or support for FI in their organization. Following the approach of Bartl et al. (2012). Taking the example of part 4, participants first rate the company’s abilities necessary to innovate frugally before being asked whether they think their company is able to successfully pursue FIs. According to Bartl et al. (2012) this evaluation allows to draw implications of certain aspects of the area of interest on the overall cognitive disposition on the topic, in our case FI.

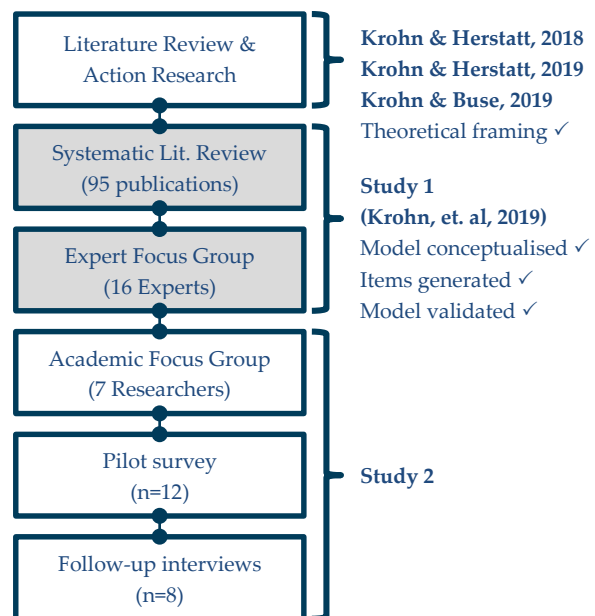


Figure 6 – Overview Outcome Study 1. Source: Own Representation

Study 1 provided us with a finalized research model, a set of items to operationalize our variables and a research instrument, which is represented in Figure 6. This progress provides the foundation for our pilot study, which will we discuss now in context with Study 2.

## 5 Study 2 - Pilot Study

To further refine the measurement tool, which we use to apply the theory of planned behaviour to the case of managerial opportunity recognition of FI, we conducted a pilot study. Besides Ajzen's (2002) suggestion for rigorous pilot work, this is common practice in the social sciences in general (Van Teijlingen & Hundley, 2002). The previously identified items were transferred into an online questionnaire, distributed via email and participants were subsequently interviewed in semi-structured interviews.

### 5.1 Methodology and Research Design

In order to test the feasibility of our research design and further refine the quality of our research instrument, we conducted a small scale pilot study following the rationale of Van Teijlingen and Hundley (2002). By generating preliminary data in a setting, which is similar to the main study, potential issues regarding the sampling technique, logistical problems, framing, wording and general practicability of the research instrument can be uncovered beforehand (Van Teijlingen & Hundley, 2002).

The questionnaire, which was developed in Study 1 was initially transformed into an online questionnaire using the online tool SurveyMonkey to simplify data collection. An invitation to the questionnaire was sent to managers in two multinational companies with headquarters in Germany. For reasons of anonymity, the companies will not be named and are labelled "company A" and "company B". Companies A and B deal with high-tech innovations and have successfully catered premium markets in multiple countries around the world. Company A is a multinational cooperation that originates from Germany and is a supplier of electrical components and solutions for various industries. The company is already engaged with one of the authors of this study in a FI action research project, which is

discussed in Krohn and Buse (2019). Most study participants of company A have also had the opportunity to attend a 30-minute presentation that contained the definition and two examples of FIs before answering the questionnaire. Moreover, it contained the presentation of the FI process discussed in Krohn and Buse (2019). Company B is headquartered in Germany and is a provider of maintenance, repair and overhaul (MRO) services for aircraft with 50 locations worldwide. Their offerings are technologically advanced and air safety standards cause high quality products. Both interviewees take leading positions in an innovative company internal venture. Participants of company B were provided with a written description containing the definition and the explanation of a market segmentation pyramid to describe the target segments of FIs. Participants of company B serve mainly to test the questionnaire with participants with less knowledge in the field of FI. The main study following this pilot study will aim at a much larger audience with potentially fewer prior exposure to FI.

Twelve participants conducted the online questionnaire and eight participants were subsequently interviewed in semi-structured interviews. The participants were selected to be similar to the actual research population, which implies that they work in positions with innovation related decision making responsibilities, such as Director of R&D, Group Manager (R&D) or Senior Product Manager. An overview of the participants and interview times can be found in Table 2 on the next page.

*Table 2 - Overview Interview Data. Source: Own Representation*

Interviewee	Company	Position	Time	Date
1	A	Vice President	11 min	29.07.19
2	A	Head of BU	11 min	30.07.19

3	A	Director R&D	22 min	31.07.19
4	A	Manager Product Portfolio Management	15 min	02.08.19
5	A	Director Product Portfolio Management	16 min	05.08.19
6	A	Group Manager (R&D)	14 min	08.08.19
7	B	CEO	19 min	25.07.19
8	B	Managing Director	17 min	05.08.19
<b>Total</b>			125 min	

The follow up interviews were conducted for multiple reasons. First of all, the theoretical understanding of FI was checked to verify the validity of the data that will be generated by the questionnaire. Secondly, overall comprehensibility of the concepts and items was discussed. Furthermore, we asked more open questions to investigate if the items generated from literature actually reflect the reality of managers confronted with innovation related decision making tasks. Lastly, the generated qualitative data also allowed to find first evidence or disproof of our research model and hypotheses. We would like to point out that we only present qualitative findings of our pilot study. This is because 12 responses would not allow to derive any quantitative conclusions and the purpose of this pilot study is to test our research instrument for comprehensibility and practicability.

Before presenting our findings, we will now discuss how we handled language and

translation for our German speaking research population.

## 5.2 Language and Translation

This working paper is written in English and builds on research predominantly published in English. However, the authors are German and our research population are managers in German companies and consequently presumably German-speaking participants. In order to prevent that our data is flawed by language barriers, the questionnaire and follow-up interviews are conducted in German. To make sure that the relationship between language and meaning is preserved and our analysis remains valid, we followed the approach of Van Mes et al. (2010). Therefore, we strive to minimize the distance between meanings expressed by the study participants and the meaning interpreted by the reader of our publication as much as possible (van Nes, et al., 2010).

Consequently, the researchers stayed in the original language as long as possible to preserve the meaning of any quote and content from the follow up interviews, (van Nes, et al., 2010). Following the interviews, the recordings were scanned while discussing in German and only once patterns in our analysis emerged, the translation took place and was exemplified with translated quotes. Since both researchers involved in this part of the research are fluent in German as well as English, the translation was done in a "side-by-side procedure" (van Nes, et al., 2010, p. 315). In this method the wordings can be discussed and supplemented with rich descriptions (van Nes, et al., 2010) before they are finalised. The written analysis was then iterated, to ensure that the quotes were not taken out of context and concepts such as metaphors and cultural expressions were translated correctly according to their expressed meaning (van Nes, et al., 2010).

### 5.3 Results of Study 2

We will now discuss the findings of our study regarding comprehensibility, practicability, validity and first qualitative insights.

Most importantly, all participants confirmed the overall comprehensibility of the questionnaire and the presented items. We did not receive any negative comments about the length of our questionnaire and participants were confident to be able to assess the situation for their company:

*„Where there is support or opposition to be expected, I think I can assess that for our company very well.“*  
– Interviewee 5

Furthermore, the interviewees were able to relate professional experiences to our areas of investigation and interviewee 3 suggested that:

*„Everything listed is [...] what you find when you go through the business. It is very close to the challenges we have.“*

However, when asked to provide their conceptual understanding of FIs, most interviewees concentrated on the focus of FI on customer needs and core functionalities but did not mention significantly reduced costs, like Interviewee 6:

*„For me its tailor-made products developed in a market. To develop exactly what the customer wants, so no excessive features that are unnecessary or not in demand.“*

Therefore, more care needs to be taken that participants of the study have a complete understanding of FI. If the questionnaire is answered with only a partial understanding of FI, validity of our findings might be compromised. We will discuss the implications of this finding in the next chapter.

Confirming the positive feedback from the focus group in Study 1, the pilot study supports the applicability of the TPB to investigate the Deliberative Frugal Mindset. Besides this confirmation we identified various insights

regarding our individual items as well as hypotheses.

Several themes reoccurred during our follow-up interviews. Most frequently, interviewees discussed the impact of previous exposure to premium market segments on the development of FI. 5 out of 8 interviewees suggested such a “premium market exposure”. For example, interviewee 8 talked about the existing company culture and suggested that:

*“You want a certain quality standard; let me tell it like this: [...] It is hard for Mercedes developers to develop a Dacia.“*

Interestingly, this focus on premium products is reflected in the acceptance of uncertainties, too. On the one hand, these technology-driven companies seem to be willing to accept risks for the development of technology focused projects as outlined by interviewee 3:

*“At the end of the day, the majority of our products needs to achieve contribution margins or profits, which does not mean that we don’t touch fields of technology where we are not sure if they are economically reasonable.“*

On the other hand, for FI more certainty for the expected sales volume is required to legitimize these decisions under uncertainty:

*“In our case the frugal product was thwarted, because the total sales volume that is necessary to produce it cost effectively was not portrayed.“*  
– Interviewee 4

This cultivation of a certain mentality towards high technology driven products was also geographically linked to Germany:

*“It [Frugal Innovations] will be very hard for us to do from Germany, because we educated our employees towards innovation and differentiation over decades.“*  
– Interviewee 8

Furthermore, the rationale for this cultivation was related to the historical success of German



companies, which was often driven by technological advances:

*“When you ask how innovative the company is or in what sense we can develop innovative processes and technologies I would say we are very good. This has distinguished us over the past decades and made us what we are today.” – Interviewee 5*

While this cultivation took place over several decades, we also found first indications that it does not have to be of permanent nature. Interviewee 2, who was involved in the FI project documented in (Krohn & Buse, 2019) said that:

*„I was rather sceptical that the employees are fixed in their models of thought, but in the course of the project I had the perception that the people became open-minded and we actually took away something. “*

Nevertheless, we expect that the current situation in many German companies will be dominated by experiences confirming the superiority of products aiming at premium market segments. This is confirming the relevance of our “premium market exposure” variable and the according hypotheses H1, H2 and H3.

Besides this frequently reoccurring theme, participants related personal experiences to various aspects already covered by the questionnaire. Due to the scope of this working paper, we will not discuss these and concentrate on aspects that are not yet covered by the previously generated items. These are the impact of project gate criteria on FI projects, effective global communication and a more detailed composition of the professional environment reflected in the subjective social norms.

In a more formalized form stage gate systems consist of a series of stages in which information regarding economic, strategic and other aspects is gathered and analysed (Cooper, 2008). These systems have become popular approaches for

driving new products to market among various companies such as Procter & Gamble (P&G), Emerson Electric, ITT and 3M (Cooper, 2008). Regardless if such a system is formally introduced or not, most organizations have approaches to decide if innovation projects are taken forward or “killed”. Interviewee 8 finds very clear words for this fact:

*„At the end its the money that counts. [...] And I plan with the target return XY, which is default by the company anyways. At the bottom line, the business plan decides whether or not we take on the project. [...] There is a profitability calculation behind everything that is standard and that is given and this plan is not be left, even in innovation projects. “*

Considering that FI sometimes tackle completely new market segments, it might be very hard to provide these hard figures for aspiring supporters of FI projects. Other aspects might also create obstacles in this context:

*„One aspect is definitely which products are still brand compliant. What product can I still sell under our brand. We are currently having very controversial discussions, where we say we ‘can offer in premium or in commodity?’ - in parts the results were [...] that the frugal product, at the end, was not viable with our image anymore. “ - Interviewee 2*

Furthermore, it is controversial for companies when they challenge their own quality standards and when they actually get in conflict with legal criteria, as pointed out by Interviewee 3:

*„We had the discussion recently, if we would develop a product for the Indian market in the future, that maybe does not have that huge demand of quality that we always think is necessary. But now comes the reverse. This could mean the product could be on the verge of legality with conformity to standards. [...] It*

*likely won't pass all the normative tests and so the device won't get CE<sup>4</sup>.*"

So, on the one hand we confirmed certain findings from Krohn et al. (2019), such as "resistance from marketing because of fear of brand dilution and loss of firms image" and "high regulatory standards and norms for products". On the other hand, no item specifically addresses project criteria, so far.

Another limitation of our set of items was pointed out by an elaboration of Interviewee 4 about communication challenges due to culture and language. While many German MNCs operate globally for many years, this remains a challenge in international collaborations, which is often the case for FI projects. This is how he summarized this elaboration:

*„We aren't always as global as we think. “*

Therefore, an item that checks for effective global communication will be included in our research instrument.

Finally, certain implications for the perceived social norms were derived from our study. As Interviewee 4 indicates:

*„I think Frugal Innovations are extremely interesting! They allow to make the right product for the right customer. [...] When it comes to the implementation, that's linked to various factors. It's all about convincing people! “*

However, it is crucial to understand which organizational stakeholders might influence decision makers' perception of the desirability and feasibility of FI projects. Two findings suggest a finer granularity of this section of the questionnaire. One participant suggested to include the production department as an important stakeholder. Furthermore, management support or resistance seems to be

framed to broadly. Another participant suggested to further refine this aspect. Consequently, we will add an item for the production department and introduce two items for management colleagues on the same or higher hierarchical positions and colleagues from lower management positions. We recall that we strive to investigate decision makers in higher management positions.

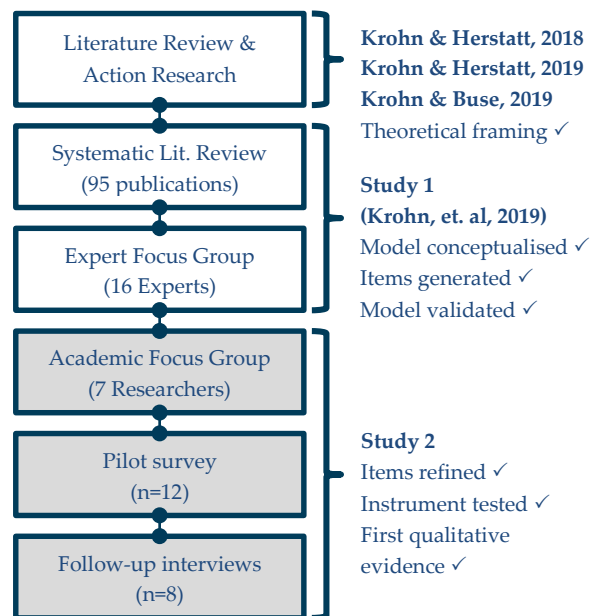


Figure 7 - Overview Outcome Study 2. Source: Own Representation

As summarized in Figure 7, we were able to confirm the comprehensibility as well as practicability of our research instrument in a setting similar to full scale study. Furthermore, the study contributed to the validity of our findings by revealing a more careful conceptual introduction of FI in the questionnaire and improved the completeness of items forming our variables of attitude, perceived social norms and perceived behavioural control. Lastly, we found first evidence for our model including the background factor "premium market exposure" and the relating hypotheses. We will now

<sup>4</sup> CE is a certification which warrants conformity with certain health, safety, and environmental standards.

discuss the implications of our two studies and derive pathways for further research.

## 6 Discussion

Based on previous conceptual work (Krohn & Herstatt, 2018; Krohn & Herstatt, 2019) and qualitative research (Krohn & Buse, 2019), we conducted a systematic literature review (Krohn, et al., 2019) and a pilot study (Krohn, et al., forthcoming); this publication) to progress in our endeavour of developing our theory of the Frugal Mindset. Framing the area of interest with Gollwitzer's (1990) mindset theory of action phases and operationalizing the process of deliberation for or against supporting FIs with Ajzen's (1991) Theory of Planned Behaviour remains a promising avenue to investigate decision makers perspective on FI. We strive to answer the question how key decision makers specifically assess the desirability and feasibility of FI opportunities. We will now discuss our progress in operationalizing the Deliberative Frugal Mindset based on a context specific adaption of the Theory of Planned Behaviour (Ajzen, 1991) and deriving respective testable hypotheses.

Earlier in this publication, we identified that further elaboration was necessary on the following three questions:

1. Does the specific context of FI require further background factors beyond the TPB specific aspects of attitude, social norm as well as behavioural control? If so, what aspects need to be included and what is the resulting research model?
2. What is a reasonable direct measure for behavioural intentions to support and initiate FI projects be operationalized?
3. What are context specific behavioural beliefs that can be applied to operationalize the perceived desirability and feasibility of FI opportunities?

Regarding question 1. We can conclude that it is advisable to include a measure of previous exposure to premium focused innovation activities. This assumption was further intensified by qualitative insights of the pilot study. Therefore, further research should include such a measure and could be inspired by the respective operationalization in Carr and Sequeira (2007). Furthermore, we proposed 6 hypotheses to test our respective research model.

Regarding question two, we build on different levels of support for FI suggested by Ramdorai and Herstatt (2017). We suggested 9 items investigating support on strategic, tactical and day to day basis. The pilot study did not reveal any shortcomings or limitations of this approach. Thus, we will continue with this operationalization.

Furthermore, we followed a standard process (Turker, 2009; DeVellis, 2016) to develop specific items to operationalize attitude, perceived social norms as well as perceived behavioural control to measure the influences on behavioural intentions to support FI projects. We initiated this process by conducting a systematic literature review of 95 publications in the field of FI. In this study we identified FI specific items to operationalize our variables. Consequently, we validated our theoretical framing and refined our measurement instrument in one expert as well as one academic focus group. The resulting research instrument was positively checked for comprehensibility and practicability in a small scale pilot study. Finally, we conducted follow-up interviews to generate first qualitative insights and further refined our research instrument.

From a qualitative standpoint we are now confident that our research instrument enables analysis of the Deliberative Frugal Mindset and thus investigating behavioral intentions to support FIs.

As the foundations for a quantitative validation of the model have been laid, ideally, one more step should be conducted before a large-scale study can be carried out. Therefore, a second pretest focused on refining the measurement model will be carried out, in order to ultimately enable conclusive analysis of the model via structural equation modeling, utilizing a partial least squares procedure (PLS-SEM).

For now, however, we will discuss theoretical implications of this study, avenues for future research and methodological limitations.

## 7 Conclusion

The importance of fast growing economies like India and China is increasing, which drives the demand for cost effective products and services. Therefore, FIs provide attractive business opportunities for globally operating companies. Yet, not all organizations seem to recognize this situation as desirable and feasible. It is questionable if key decision makers in these organisations have the right mindset to initiate and support respective innovation projects. We took on previous research on the Frugal Mindset and discussed the results of two recent studies to further develop our theory and shed light on this issue. In our first study we developed items based on the Theory of Planned Behaviour by conducting a systematic literature review of 95 publications and validate as well refine this approach in a focus group discussion with 16 experts on Frugal Innovation as well as one academic focus group. This is an important step to measure the cognitive predisposition of decision makers towards FI and consequently learn more about their mindset.

Furthermore, we successfully tested our research instrument for practicability, comprehensibility and further refine the items in a pilot study including 8 follow-up interviews with managers from 2 MNCs. Based on this procedure we discuss our research model

including 6 hypotheses, a measurement instrument and first qualitative insights on the Deliberative Frugal Mindset. Most importantly, these qualitative insights indicate a negative influence of previous exposure to innovation activities focusing on premium market segments on the formation of attitude, social norm and PCB concerning support and initiation of FI projects.

This working paper makes important theoretical contributions to the field of FI. The significance of a Frugal Mindset has been suggested early on in the discussion of FI (Soni & Krishnan, 2014; Zeschky, et al., 2011) and remains an important practical issue today (Krohn & Buse, 2019). However, so far no study attempts a theory driven or empirical investigation to shed light on the managerial perception of FI. Furthermore, most publications in the field of FI apply a qualitative research approach. We address both gaps and take important steps to facilitate a quantitative investigation of decision makers' cognitive predisposition towards FI. This paper presents FI specific items to measure the attitude, perceived social norms and perceived behavioural control regarding support and initiation of FI projects and thus, the opportunity to explain respective behavioural intentions. Furthermore, we present strong indications that these variables are influenced by what we call pervious premium market exposure. This is in line with our earlier discussion of a potential individual level path dependency (Sydow, et al., 2009) in (Krohn & Herstatt, 2018).

This might also be of significant importance from a practical point of view. Germany, as a country that has a historical focus on high-tech solutions might create a systemic bias against FIs. The economic opportunities provided by innovations characterized by a focus on core functionality, an optimized performance level and significant cost reductions might not be objectively assessed by decision makers in German companies. Thus, innovation

champions who see respective opportunities for their organizations need systematic support in changing mindsets. As indicated in Study 2 and Krohn and Buse (2019), this mindset change seems to be possible.

Furthermore, the Theory of Planned Behaviour has been successfully applied to design initiatives aiming at supporting organizational change. Jimmieson et al. (2008, p. 259) conclude that: "The identification of beliefs that underlie attitude, subjective norm, and perceived behavioural control may help change managers to develop a greater understanding of the psychological factors that distinguish between those employees who support the change and those who do not. Such assessments should help

change agents to make targeted choices about strategies and tactics that are needed to help foster employee enthusiasm for change." Furthermore, Jimmieson et al. (2008) find evidence that persuasive communication and participation strategies can help to change underlying beliefs in this regard.

Until this point our research builds on findings from literature review and qualitative approaches and our hypotheses need to be tested. This step will allow to assess which underlying beliefs specifically and most significantly impact the formation of behavioural intentions. Therefore, future research needs to apply the research instrument in a full-scale quantitative study.

## 8 References

- Adegbile, A. & Sarpong, D., 2018. Disruptive innovation at the base-of-the-pyramid. *Critical Perspectives on International Business*, 14(2), p. 111–138.
- Agarwal, N., Grottke, M., M. S. & Brem, A., 2017. A systematic literature review of constraint-based innovations: state of the art and future perspectives. *IEEE Transactions on Engineering Management*, 64(1), pp. 3-15.
- Agnihotri, A., 2015. Low-cost innovation in emerging markets. *Journal of Strategic Marketing*, 23(5), p. 399–411.
- Ahuja, S., 2014. Cost vs. Value + Empathy: A New Formula for Frugal Science. *Design Management Review*, 25(2), p. 52–55.
- Ajzen, I., 1988. *Attitudes, personality, and behavior*. Chicago: Dorsey.
- Ajzen, I., 1991. The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), p. 179–211.
- Ajzen, I., 2002. Constructing a TPB questionnaire: Conceptual and methodological considerations.
- Ajzen, I., 2002. Residual effects of past on later behavior: Habituation and reasoned action perspectives. *Personality and social psychology review*, 6(2), pp. 107-122.
- Ajzen, I. & Fishbein, M., 2005. The influence of attitudes on behavior. In: *The handbook of attitudes*. 31 ed. s.l.:s.n., pp. 173-221.
- Altmann, P. & Engberg, R., 2016. Frugal Innovation and Knowledge Transferability. *Research Technology Management*, 59(1), p. 48–55.
- Andel, T., 2013. Frugal Price: Virtue or Vice?. *Material Handling & Logistics*, 68(11), p. 4.

- Angot, J. & Plé, L., 2015. Serving poor people in rich countries: the bottom-of-the-pyramid business model solution. *Journal of Business Strategy*, 36(2), pp. 3-15.
- Anon., 2011. The Evolution of R&D. *Research Technology Management*, 54(3), p. 65-66.
- Antons, D. & Piller, F. T., 2015. Opening the black box of "Not Invented Here": Attitudes, decision biases, and behavioral consequences. *Academy of Management Perspectives*, 29(2), pp. 193-217.
- Aranda-Jan, C. B., Jagtap, S. & Moultrie, J., 2016. Towards A Framework for Holistic Contextual Design for Low-Resource Settings. *International Journal of Design*, p. 43-63.
- Bandura, A., 2000. Exercise of human agency through collective efficacy. *Current directions in psychological science*, 9(3), pp. 75-78.
- Banerjee, P. M. & Leirner, A., 2014. Frugal innovation and returnee-diaspora entrepreneurship. In: *Handbook of research on techno-entrepreneurship*. Second edition ed. Cheltenham, U.K; Northampton, MA, USA: Edward Elgar Publishing, p. tiw.
- Bartl, M., Füller, J., Mühlbacher, H. & Ernst, H., 2012. A manager's perspective on virtual customer integration for new product development. *Journal of Product Innovation Management*, 29(6), pp. 1031-1046.
- Bhatti, Y., Khilji, S. E. & Basu, R., 2013. Frugal innovation. In: *Globalization, Change and Learning in South Asia*. Cambridge, UK: Chandos Pub, p. 123-145.
- BMBF, 2018. <https://www.bmbf.de/en/the-new-high-tech-strategy-2322.html>. [Online] Available at: <https://www.bmbf.de/en/the-new-high-tech-strategy-2322.html> [Accessed 14 2019].
- Borini, F. M., Costa, S., Oliveira Junior, Moacir de Mir & a, 2016. Reverse innovation antecedents. *INTERNATIONAL JOURNAL OF EMERGING MARKETS*, p. {175-189}.
- Borkovec, T. D., 2002. Life in the future versus life in the present. *Clinical Psychology: Science and Practice*, Volume 9, p. 76-80.
- Breen, R. L., 2006. A Practical Guide to Focus-Group Research. *Journal of Geography in Higher Education*, 30(3), p. 463-475.
- Brown, B. & Anthony, S. D., 2011. How P&G Tripled Its Innovation Success Rate. *Harvard Business Review*, p. 64+.
- Carr, J. C. & Sequeira, J. M., 2007. Prior family business exposure as intergenerational influence and entrepreneurial intent: A theory of planned behavior approach. *Journal of business research*, 60(10), pp. 1090-1098.
- Chittoor, R. & Aulakh, P. S., 2015. Organizational Landscape in India: Historical Development, Multiplicity of Forms and Implications for Practice and Research. *Long Range Planning*, 48(5), p. 291-300.
- Christensen, C. M., Baumann, H., Ruggles, R. & Sadtler, T. M., 2006. Disruptive Innovation for Social Change. *Harvard Business Review*, 84(12), p. 94-101.
- Clark, M. et al., 2017. *Technology Management: Case of Cost, Frugal and Reverse Innovations*. In: *Research and Development Management*. Cham: Springer International Publishing, p. 227-246.

- Cooper, R. G., 2008. Perspective: The Stage-Gate® Idea-to-Launch Process—Update, What's New, and NexGen Systems. *Journal of Product Innovation Management*, 25(3), p. 213–232.
- Corsi, S., Di Minin, A. & Piccaluga, A., 2014. Reverse Innovation at Speres: A Case Study in China. *Research Technology Management*, 57(4), p. 28–34.
- De Brentani, U. & Kleinschmidt, E. J., 2004. Corporate culture and commitment: impact on performance of international new product development programs. *Journal of product innovation management*, 21(5), pp. 309-333.
- De Jong, J. P. & Den Hartog, D. N., 2007. How leaders influence employees' innovative behaviour. *European Journal of innovation management*, 10(1), pp. 41-64.
- Delanoë-Gueguen, S. & Fayolle, A., 2018. Crossing the Entrepreneurial Rubicon: A Longitudinal Investigation. *Journal of Small Business Management*. *Journal of Small Business Management*.
- DeVellis, F. R., 2016. Scale development: Theory and applications. Fourth Edition ed. s.l.:Sage publications.
- Eckhardt, J. & Shane, S., 2003. Opportunities and entrepreneurship. *Journal of Management*, Volume 29, p. 333–349.
- Ernst and Young, 2015. Megatrends 2015: Making Sense of a World in Motion., s.l.: s.n.
- Ernst, H. et al., 2015. The antecedents and consequences of affordable value innovations for emerging markets. *Journal of Product Innovation Management*, 32(1), pp. 65-79.
- Farooq, R., 2017. A conceptual model of frugal innovation: is environmental munificence a missing link?. {INTERNATIONAL JOURNAL OF INNOVATION SCIENCE}, 9(4), p. 320–334.
- Fayolle, A., Basso, O. & Tornikoski, E., 2011. Entrepreneurial commitment and new venture creation: A conceptual exploration. In: *Handbook of research on new venture creation*. Cheltenham (UK): Edward Elgar Publishing, pp. 160-182.
- Fazio, R. H., 1990. Multiple processes by which attitudes guide behavior: The MODE model as an integrative framework. *Advances in experimental social psychology*, Volume 23, pp. 75-109.
- Fisch, C. & Block, J., 2018. Six tips for your (systematic) literature review in business and management research. *Management Review Quarterly*, 68(2), p. 103–106.
- French II, R. P., 2016. The fuzziness of mindsets: Divergent conceptualizations and characterizations of mindset theory and praxis. *International Journal of Organizational Analysis*, 24(4), pp. 673-691.
- Frigo, M. L., 2013. Reverse Innovation: A New Pathway for Growth. 95(5).
- Gill, P., Stewart, K., Treasure, E. & Chadwick, B., 2008. Methods of data collection in qualitative research: interviews and focus groups. *British dental journal*, 204(6), p. 291–295.
- Gollwitzer, P. M., 1990. Action phases and mind-sets. In: *Handbook of motivation and cognition: Foundations of social behavior*. 2 ed. s.l.:s.n., pp. 53-92.
- Govindarajan, V., 2011. Reverse Innovation at Davos. *Harvard Business Review Digital Articles*, p. 2–3.
- Govindarajan, V., 2012. A Reverse-Innovation Playbook. {HARVARD BUSINESS REVIEW}, 90(4), p. 120–124.

- Gupta, A. K., 2013. Tapping the entrepreneurial potential of grassroots innovation. *Stanford Social Innovation Rev*, 11(3), pp. 18-20.
- Hadengue, M., Marcellis-Warin, N., Zedtwitz, M. & Warin, T., 2017. Avoiding the Pitfalls of Reverse Innovation. *Research Technology Management*, 60(3), p. 40-47.
- Hang, C. C., Garnsey, E. & Ruan, Y., 2015. Opportunities for disruption. {TECHNOVATION}, Volume 39, p. 83-93.
- Hart, S., Sharma, S. & Halme, M., 2016. Poverty, Business Strategy, and Sustainable Development. {ORGANIZATION \& ENVIRONMENT}, 29(4), p. 401-415.
- Henley, A., 2007. Entrepreneurial aspiration and transition into self-employment: evidence from British longitudinal data. *Entrepreneurship and Regional Development*, Volume 19, pp. 253-280.
- Herstatt, C. & Tiwari, R., 2017. India's Emergence as a Lead Market for Frugal Innovations: An Introduction to the Theme and to the Contributed Volume. In: *Lead Market India: Key Elements and Corporate Perspectives for Frugal Innovations*. Gewerbestraße 11, Cham, Switzerland: Springer International Publishing AG.
- Hossain, M., 2018. Frugal innovation: A review and research agenda. {JOURNAL OF CLEANER PRODUCTION}, Volume 182, p. 926-936.
- Hyypiä, M. & Khan, R., 2018. Overcoming Barriers to Frugal Innovation: Emerging Opportunities for Finnish SMEs in Brazilian Markets. *Technology Innovation Management Review*, 8(4), p. 38-48.
- Immelt, J. R., Govindarajan, V. & Trimble, C., 2009. How GE is disrupting itself.. *Harvard business review*, 87(10), pp. 56-65.
- Ireland, R. D., Covin, J. G. & Kuratko, D. F., 2009. Conceptualizing corporate entrepreneurship strategy. *Entrepreneurship theory and practice*. 31(1), pp. 19-46.
- Janda, S., Schuhmacher, M. C. & Kuester, S., 2018. Reversing Gears. *Research Technology Management*, 61(1), p. 46-57.
- Jha, S. K. & Krishnan, R. T., 2013. Local innovation: The key to globalisation. *IIMB Management Review (Elsevier Science)*, 25(4), p. 249-256.
- Jimmieson, N. L., Peach, M. & White, K. M., 2008. Utilizing the theory of planned behavior to inform change management: An investigation of employee intentions to support organizational change. *The journal of applied behavioral science*, 44(2), pp. 237-262.
- Kachaner, N., Lindgardt, Z. & Michael, D., 2011. Innovating low-cost business models. *Strategy & Leadership*, 39(2), p. 43-48.
- Kaplan, S., 2012. LEADING DISRUPTIVE INNOVATION. *Ivey Business Journal*, 76(4), p. 1-4.
- Kautonen, T., Van Gelderen, M. & Tornikoski, E. T., 2013. Predicting entrepreneurial behaviour: a test of the theory of planned behaviour. *Applied Economics*, 45(6), pp. 697-707.
- Krohn, M. & Buse, S., 2019. Developing and Implementing Frugal Innovation Mindsets in Organizations. In: *Frugal innovation: A cross global research companion..* London: Routledge.



- Krohn, M. & Herstatt, C., 2018. The question of a Frugal Mindset in Western MNCs: Exploring an emerging phenomenon with a systematic literature review. Working Paper 103, Hamburg University of Technology (TUHH), Institute for Technology and Innovation Management.
- Krohn, M. & Herstatt, C., 2019. Vision for Frugal Innovation: Power of Mindsets for Transformation.. In: Frugal innovation: A cross global research companion.. London: Routledge.
- Krohn, M., Hochmuth, D. & Herstatt, C., forthcoming. The Deliberative Frugal Mindset - A Pilot Study for a Model of Managerial Opportunity Recognition for Frugal Innovations. Antwerp, Belgium, s.n.
- Krohn, M., Petersen, F. & Herstatt, C., 2019. Understanding Managers Perspectives in the Face of Global Socio-Economic Shifts – Towards an Instrument to Measure the Recognition of Opportunities for Frugal Innovation. Paris, France, R&D Management Conference.
- Krueger, N. F., 2007. The cognitive infrastructure of opportunity emergence. In: Entrepreneurship. Berlin, Heidelberg: Springer, pp. 185-206.
- Leavy, B., 2011. Vijay Govindarajan: innovation coach to the developed and developing world. 39(5).
- Leliveld, A. & Knorringa, P., 2018. Frugal Innovation and Development Research. {EUROPEAN JOURNAL OF DEVELOPMENT RESEARCH}, 30(1), p. 1–16.
- Lim, C., Han, S. & Ito, H., 2013. Capability building through innovation for unserved lower end mega markets. {TECHNOVATION}, 33(12), p. 391–404.
- Linna, P., 2013. Bricoiage as a Means of Innovating in a Resource-Scarce Environment: A study of innovator-entrepreneurs at the BoP. Journal of Developmental Entrepreneurship, 18(3), p. 1–23.
- Mallett, R., Hagen-Zanker, J., Slater, R. & Duvendack, M., 2012. The benefits and challenges of using systematic reviews in international development research. Journal of Development Effectiveness, 4(3), p. 445–455.
- Marcati, A., Guido, G. & Peluso, A. M., 2008. The role of SME entrepreneurs' innovativeness and personality in the adoption of innovations. Research Policy, 37(9), pp. 1579-1590.
- Masadeh, M. A., 2012. Focus Group: Reviews and Practices. International Journal of Applied Science and Technology, Issue 10, p. 63–68.
- Mays, N., Pope, C. & Popay, J., 2005. Systematically reviewing qualitative and quantitative evidence to inform management and policy-making in the health field. Journal of health services research & policy, p. 6–20.
- Mazieri, M. R., Vils, L. & Queiroz, M. J., 2017. Frugal innovation beyond emerging countries: the key role of developed countries. ["Innovación frugal además de los países emergentes: el papel fundamental de los países desarrollados.", "Inovação frugal além dos países emergentes: o papel fundamental dos países desenvolvidos."], 17(4), p. 232–257.
- Micaelli, J.-P., Forest, J., Bonjour, E. & Loise, D., 2016. Frugal innovation or frugal renovation: how can western designers adopt frugal engineering?. Journal of Innovation Economics & Management, Issue 21, p. 39–56.
- Mukerjee, K., 2012. FRUGAL INNOVATION: THE KEY TO PENETRATING EMERGING MARKETS. Ivey Business Journal, 76(4), p. 1–3.

- Nickerson, R. S. (., 1998. Confirmation bias: A ubiquitous phenomenon in many guises. *Review of general psychology*, 2(2), pp. 175-220.
- Nielsen, 2015. Looking to Achieve New Product Success? Listen to Your Consumers.. [Online] Available at: <http://www.nielsen.com/content/dam/corporate/us/en/>
- Pandit, D., Joshi, M. P., Sahay, A. & Gupta, R. K., 2018. Disruptive innovation and dynamic capabilities in emerging economies: Evidence from the Indian automotive sector. *Technological Forecasting and Social Change*, Volume 129, p. 323–329.
- Park, E. & Ohm, J. Y., 2015. Appropriate Technology for Sustainable Ecosystems: Case Studies of Energy Self-Reliant Villages and the Future of the Energy Industry. {SUSTAINABLE DEVELOPMENT}, 23(2), p. 74–83.
- Pisoni, A., Micheline, L. & Martignoni, G., 2018. Frugal approach to innovation: State of the art and future perspectives. {JOURNAL OF CLEANER PRODUCTION}, Volume 171, p. 107–126.
- Prahalad, C. K., 2006. *The Fortune at the Bottom of the Pyramid*. s.l.:Pearson Education India.
- Prahalad, C. K. & Hart, S. L., 2002. *The Fortune at the Bottom of the Pyramid*. *strategy+business*, Issue 26, pp. 54-67.
- Pratt, M. G., 2009. From the editors: For the lack of a boilerplate: Tips on writing up (and reviewing) qualitative research.. *Academy of Management Journal*, 52(5).
- Radjou, N. & Euchner, J., 2016. *The Principles of Frugal Innovation*. 59(4).
- Radjou, N. & Prabhu, J., 2014. 4 CEOs Who Are Making Frugal Innovation Work. *Harvard Business Review Digital Articles*, p. 2–5.
- Radojević, N., 2015. Reverse Innovation Reconceptualised: Much Geo-Economic ado about Primary Market Shift. *La innovación inversa y la transferencia de tecnología inversa: Del hecho en China al descubierto en China en el sector farmacéutico.*, "Innovation inverse et transfert technologique inverse : Du fabriqué en Chine au découvert en Chine dans le secteur pharmaceutique.", 19(4), p. 70–82.
- Ramdorai, A. & Herstatt, C., 2015. *Frugal innovation in healthcare: How targeting low-income markets leads to disruptive innovation*. s.l.:Springer.
- Ramdorai, A. & Herstatt, C., 2017. *Lessons from Low-Cost Healthcare Innovations for the Base-of the Pyramid Markets*. In: *Lead Market India: Key Elements and Corporate Perspectives for Frugal Innovations*. Gewerbestraße 11, Cham, Switzerland: Springer International Publishing AG, p. 119–144.
- Rao, B. C., 2017. *Advanced Frugal Innovations [Leading Edge]*. *IEEE Technology & Society Magazine*, 36(4), p. 53–54.
- Ravishankar, M. N., 2016. A Bricolage Perspective on Technological Innovation in Emerging Markets. *IEEE Transactions on Engineering Management*, 63(1), p. 53–66.
- Ray, P. K. & Ray, S., 2010. Resource-Constrained Innovation for Emerging Economies: The Case of the Indian Telecommunications Industry. *IEEE Transactions on Engineering Management*, 57(1), p. 144–156.

- Reficco, E. & Gutiérrez, R., 2016. Organizational Ambidexterity and the Elusive Quest for Successful Implementation of BoP Ventures. {ORGANIZATION \& ENVIRONMENT}, 29(4), p. 461–485.
- Reinhardt, R., Gurtner, S. & Griffin, A., 2018. Towards an adaptive framework of low-end innovation capability—A systematic review and multiple case study analysis. Long Range Planning.
- Reinhardt, R., Gurtner, S., Hoskins, J. & Griffin, A., 2017. The High-end Bias—Investigating the Irrational Preference for High-end over Low-end Innovations. s.l., Academy of Management, p. 13528.
- Rosenberg, M. J. & Hovland, C. I., 1960. Cognitive, affective, and behavioral components of attitudes. In: Attitude organization and change: An analysis of consistency among attitude. New Haven, CT: Yale University Press, pp. 1-14.
- Schein, E., 1985. Organizational culture and leadership. San Francisco: Jossey-Bass.
- Shan, J. & Khan, M., 2016. Implications of Reverse Innovation for Socio-Economic Sustainability: A Case Study of Philips China. SUSTAINABILITY, 8(6), p. 530.
- Shankar, V. & Hanson, N., 2013. How Emerging Markets are Reshaping the Innovation Architecture of Global Firms. In: Review of Marketing Research. Bradford: Emerald Group Publishing Limited, p. 191–212.
- Sharmelly, R. & Ray, P. K., 2018. The role of frugal innovation and collaborative ecosystems: The case of Hyundai in India. Journal of General Management, 43(4), p. 157–174.
- Silva, I. M. et al., 2018. Antecedents of cost innovation: the combined impact of strategy and organisational culture. {INTERNATIONAL JOURNAL OF INNOVATION AND LEARNING}, p. {327–344}.
- Simula, H., Hossain, M. & Halme, M., 2015. Frugal and Reverse Innovations Quo Vadis?. SSRN Electronic Journal.
- Song, G., Yu, D. & Lu, X., 2017. Research on the Influencing Factors of Reverse Innovation of Non - core Enterprises. p. 5–10.
- Soni, P. & Krishnan, T., 2014. Frugal innovation: aligning theory, practice, and public policy. Journal of Indian Business Research, 6(1), pp. 29-47.
- Sydow, J., Schreyögg, G. & Koch, J., 2009. Organizational path dependence: Opening the black box. Academy of management review, 34(4), pp. 689-709.
- Tiwari, R., Fischer, L. & Kalogerakis, K., 2017. Frugal Innovation. In: Lead Market India: Key Elements and Corporate Perspectives for Frugal Innovations. Gewerbestraße 11, Cham, Switzerland: Springer International Publishing AG, p. 13–35.
- Tiwari, R., Kalogerakis, K. & Herstatt, C., 2017. Developing Frugal Innovations with Inventive Analogies. In: Lead Market India: Key Elements and Corporate Perspectives for Frugal Innovations. Gewerbestraße 11, Cham, Switzerland: Springer International Publishing AG, p. 147–162.
- Tranfield, D., Denyer, D. & Smart, P., 2003. Towards a Methodology for Developing Evidence-Informed Management Knowledge by Means of Systematic Review. British Journal of Management, 14(3), p. 207–222.

- Turker, D., 2009. Measuring corporate social responsibility: A scale development study. *Journal of business ethics*, 85(4), pp. 411-427.
- van Nes, F. A., T., J. H. & Deeg, D., 2010. Language differences in qualitative research: is meaning lost in translation. *European journal of ageing*, 7(4), pp. 313-316.
- Van Teijlingen, E. R. & Hundley, V., 2002. The importance of pilot studies. *Nursing Standard*, 16(50), pp. 33-36.
- Wan, F., Williamson, P. J. & Yin, E., 2015. Antecedents and implications of disruptive innovation: Evidence from China. *Technovation*, Volume 39-40, p. 94-104.
- Webster, J. & Watson, R. T., 2002. Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, 26(2), p. xiii-xxiii.
- Welt, 2013. Deutsche Baumaschinen zu gut für den Weltmarkt. [Online] Available at: <https://www.welt.de/wirtschaft/article115375886/Deutsche-Baumaschinen-zu-gut-fuer-den-Weltmarkt.html> [Accessed 28 05 2018].
- Weyrauch, T. & Herstatt, C., 2016. What is frugal innovation? Three defining criteria.. *Journal of frugal innovation*, 2(1), p. 1.
- Winter, A. & Govindarajan, V., 2015. Engineering reverse innovations. {HARVARD BUSINESS REVIEW}, 93(7), p. 80-89.
- Winterhalter, S., Zeschky, M. B. & Gassmann, O., 2016. Managing dual business models in emerging markets: an ambidexterity perspective. *R&D Management*, 46(3), p. 464-479.
- Wooldridge, A., 2010. The world turned upside down. *The Economist*, Issue 21.
- Xu, N. & Xu, Y., 2016. Research on the key success factors of reverse innovation of the latecomer engineering and technical services enterprises. *Journal of Science and Technology Policy Management*, 7(1), p. 58-76.
- Zedtwitz, M., Corsi, S., Søberg, P. V. & Frega, R., 2015. A Typology of Reverse Innovation. {JOURNAL OF PRODUCT INNOVATION MANAGEMENT}, 32(1), p. 12-28.
- Zeschky, M. B., Winterhalter, S. & Gassmann, O., 2014. From Cost to Frugal and Reverse Innovation. *Research Technology Management*, Issue 57, p. 20-27.
- Zeschky, M., Widenmayer, B. & Gassmann, O., 2011. Frugal innovation in emerging markets. *Research-Technology Management*, 4(54), pp. 38-45.
- Zhu, F., Zou, S. & Xu, H., 2017. Launching reverse-innovated product from emerging markets to MNC's home market: A theoretical framework for MNC's decisions. {INTERNATIONAL BUSINESS REVIEW}, 26(1), p. 156-163.