Frugal Innovation: An Assessment of Scholarly Discourse, Trends and Potential Societal Implications

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Abstract

The topic of frugal innovation is increasingly gaining relevance in social as well as scholarly discourse. Frugal innovations have been perceived by many to be a phenomenon generally confined to emerging economies where there are large groups of unserved consumers with unmet needs. But there is increasing evidence that this phenomenon is getting relevant also in the industrialized nations potentially affecting the long-term competitiveness of domestic firms not only overseas but also at home. This paper has a two-fold objective: (a) It seeks to establish the theoretical antecedents of frugal innovation by examining the scholarly discourse; and (b) It attempts to generate hypotheses about its long-term relevance by examining historical trends of frugality and their disappearance. Based upon an extensive literature review and some preliminary primary data we propose a new working definition for frugal innovation and hypothesize that frugality was a key social value with positive associations before the era of unprecedented prosperity in the industrialized world, which led to saturated markets and inter alia to feature-driven competition and over-consumption of resources. New ground realities, e.g., economic downturn in the industrialized world and the rapidly rising consumption in the economically developing world, are expected to turn frugality, once again, into an important societal value and frugal innovation into a critical success factor in mid-term future.

Keywords: Frugal Innovation; Frugality; Thrift; Responsible Innovation; Sustainable Growth; Competitiveness; International Business; Emerging Economies; Industrialized Nations

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1. Introduction

The topic of frugal innovation is increasingly gaining relevance in the social as well as scholarly discourse (Bound and Thornton, 2012; Radjou and Prabhu, 2015; Ramdorai and Herstatt, 2015). Frugal innovations have been generally associated with emerging economies where there are large groups of unserved consumers with unmet needs (see, e.g., Zeschky, Widenmayer, and Gassmann, 2011; Tiwari and Herstatt, 2012a; Brem and Ivens, 2013; Jänicke, 2014). But there is now increasing evidence that this phenomenon is getting relevant also in the industrialized nations potentially affecting long-term competitiveness of domestic firms from the developed world not only overseas but also at home (Tiwari and Herstatt, 2013; Zweck, Holtmannspötter, Braun, Hirt et al, 2015). These developments have already led to some initiatives by state institutions in Germany and the European Union to examine the potential mid-to-long term implications of this phenomenon (see, e.g., BMBF, 2014; European Commission, 2015).

At the same time, however, theoretical antecedents of frugal innovation remain largely unclear as of today. The phenomenon of frugal innovation was initially observed in the fast-growing economies of the developing world, such as China and India, and subsequently reported by the business press (see, e.g., Economist, 2009; Lamont, 2010b; Sehgal, Dehoff, and Panneer, 2010). Many scholarly publications that followed have tried to comprehend and define this phenomenon while remaining settled in the context of emerging economies (Zeschky *et al*, 2011; Tiwari and Herstatt, 2012a). A deeper going investigation of theoretical antecedents and classification has so far been scarce (see, e.g., Simula, Hossain, and Halme, 2015), despite some notable efforts (e.g. Bhatti, 2012; Tiwari and Herstatt, 2014; Zeschky, Winterhalter, and Gassmann, 2014b; Herstatt and Tiwari, 2015). An in-depth understanding of the theoretical roots is, however, necessary both to understand the mid-to-long term implications of frugal innovation for the various societal stakeholders as well as to assess the longevity of this phenomenon itself.

This paper is part of a study carried out to assess the potentials of frugal innovation and its probable implications in the specific context of Germany.[4] The study is being carried out

[4] This study presents the results achieved in Work Package 1 of the BMBF-supported study "Potenziale, Herausforderungen und gesellschaftliche Relevanz frugaler Innovationen in Deutschland im Kontext des globalen Innovationswettbewerbs" (English title: Potentials, Challenges and Societal Relevance of Frugal Innovations for Germany in the Context of Global Innovation Competition).

under the aegis of the ITA programme of the German Federal Ministry of Education and Research (BMBF). In this paper we primarily follow three objectives: (a) We examine the scholarly discourse on frugal innovation to establish its theoretical antecedents; (b) We attempt to identify historical trends of frugality, and their disappearance, to generate hypotheses about its long-term relevance; (c) We seek to understand the social discourse on frugal innovation in the German context to assess its social perception.

Based upon an extensive literature review we hypothesize that frugality was a key social value before the era of unprecedented prosperity in the industrialized world led to saturated markets and inter alia to feature-driven competition (Nowlis and Simonson, 1996) and over-consumption of resources (Bocken and Short, 2016). However, results from an expert workshop and three focus groups held in January 2016 within the framework of this project indicate that new ground realities, e.g., economic downturn in the industrialized world and the rapidly rising consumption in the economically developing world, are expected by many stakeholders to turn frugality into a positive social value and frugal innovation into a critical success factor in the future again.

This paper is structured along the following lines. After this brief introduction we take a closer look at the philosophical context of frugality and prepare the background of section 3, in which we examine the theoretical antecedents of frugal innovation by first examining the origins and perception of frugality in the political economy and then connecting it to other related disciplines. Here frugality is also analysed in the context of innovation management. Results of a workshop and three focus groups are presented in section 4. The paper ends with conclusions in section 5.[5]

2. Philosophical Context of Frugality

"The heart is great which shows moderation in the midst of prosperity."

(Lucius Annaeus Seneca, c. 4 BC – AD 65)

[5] This study is the result of a coordinated and shared work between both institutional partners. Fraunhofer MOEZ has been in the lead for the work the philosophical context of frugality (section 2), whereas TUHH has been primarily responsible for working out the theoretical/scientific context of frugal innovation (section 3) and the evaluation of the workshop results (section 4).

Having shown that the frugal innovation and frugality are increasingly present in the social discourse in Germany, we turn our attention to the historical perception and relevance of frugality. This is done with the purpose of identifying factors that eventually affect the acceptance of frugality in the society and that, thus, may affect the longevity of the phenomenon of frugal innovation. Based on research of secondary academic literature, the section particularly highlights the role of frugality in ancient times, during the Enlightenment, and since the industrial revolution. It thus points to the importance of investigating the history and geography of frugality, especially when aiming to better understand its relation to questions of innovation, progress, and sustainability. The section provides an insight into the current state of research; it does not claim to be a comprehensive history and geography of the notion "frugality"; such a project would go beyond the scope and purpose of this section.

Whilst a trend towards frugal innovation might seem very recent, the overarching notion of frugality is, in fact, an ancient one. The concept of frugality has philosophical and religious roots both in Western and Eastern traditions. Philosophers and theologians of ancient times promoted temperance, moderation, and self-restraint. Epicurean ethics and Stoic philosophers stressed the benefits of a frugal life. Epicurus emphasised the importance of limiting desires, avoiding lust, and living with moderation (see, e.g., Avotins, 1977; Bouckaert, Opdebeeck, and Zsolnai, 2008). Stoic philosophers, such as Cicero and Seneca, favoured a stoic lifestyle based on simplicity and self-restraint. Also Aristoteles is famous for his arguments on the golden mean and ethics of moderation (see, e.g., Koselleck, 1994; Ims and Jakobsen, 2008). In eastern philosophy, particularly Buddhism and Neo-Confucianism appreciated frugality and material simplicity as virtues (see Schumacher, 1966; Lai, 2013). Lao-Tzu, founder of Daoism, is known for his writings on frugality and simplicity (Low, 2009).

Thoughts on frugality were also popular during the Enlightenment. Particularly at the advent of mercantilism and industrialisation, European Enlightenment thinkers discussed the role of self-control and the passions, of moderation, and frugality. Munzel (2012) has suggested that Immanuel Kant, the founder of German idealism, saw frugality as a way to happiness and simplicity as the order of nature (see, e.g., Meld Shell and Velkley, 2012; Munzel, 2012). Kant distinguished between different kinds of frugality and favoured the virtue of frugality out of choice and based on rational thinking: "The state of the individual who is satisfied because he does not know the amenities is one of simple frugality, while the state of the individual who knows them but voluntarily dispenses with them because he fears to unrest to which they give rise, is one of wise frugality" (Kant cited after Munzel, 2012: 171). Adam

Smith thought of frugality as a form of virtuous behaviour; he praised the "frugal man" both in *Theory of Moral Sentiments* (1759) and in *An Inquiry into the Nature and Causes of the Wealth of Nations* (1776; see also Brown, 1994). Eighteenth-century French philosophers discussed the early industries and debated their moral consequences (Schui, 2005: 124-126). Similarly, also religious groups promoted frugality, as Max Weber has shown in *The Protestant Ethic and the Spirit of Captialism* (Weber, 1904).

During late eighteenth century then, thinkers developed stereotypes of the German and European (especially also English and French) middle class based on Enlightenment theories of civilization and progress fused with ideas of ancient philosophers, such as the Aristotelian tradition (Koselleck, 1994: 210). Frugality and a moderate lifestyle were central elements of these theories and sociological descriptions. The frugal stereotype of the emerging middle class only somewhat lost its importance during the first half of the nineteenth century, especially in the years between the Congress of Vienna and the Revolution in 1848. Also popular during the eighteenth century were utopias and projections into the future including moral projections. The Enlightenment philosopher Adam Weishaupt (1748-1830) argued in 1787 that in future societies, living on a fully populated earth, virtues based on frugality and moderation would not only be a matter of choice but a necessary condition to guarantee peace and social stability (cited after Neugebauer-Wölk, 1996: 184).

With the beginning of the consumer society and the growing appraisal of consumerism amongst a majority of the population in the industrialised countries frugality began to vanish as a virtue in the twentieth century. A certain generation influenced by the wars however still kept their frugal virtues (Budde, 2009; Münkel, 2009). During the last decades, some authors have cautioned against the growth of consumerism. Ernst Friedrich Schumacher promoted a philosophy of "enoughness" in his book *Small is Beautiful: A Study of Economics As If People Mattered* (Schumacher, 1973). As part of his philosophy of "enoughness", Schumacher (1966) coined the notion of "Buddhist Economics". Recent scholarship has advanced this notion. Zsolnai (2008) has suggested Schumacher's Buddhist economics as an alternative to current Western economics: as an economic system not based on profit-making, but centred on benefiting the human character, i.e., not to multiply but to simplify desires (Zsolnai, 2008).

Frugality has also been highlighted since the beginning of the discourse on sustainability. Jonas (1985) has argued for frugality as "a rather old virtue that has lost its importance rather recently." Jonas has pointed to the frugal virtue both in ancient times and in religious texts and teachings. For Jonas, frugality is promoted through upbringing and education. Even more recently, scholars across disciplines have begun to revisit questions concerning the relationship between ethics and economics. Bouckaert et al (2008) in their edited volume *Frugality: Rebalancing Material and Spiritual Values in Economic Life* discuss the interplay between ethics and economics – the economics of frugality – and suggests that frugality has by many been seen as “contrary to consumerism and wild economic growth” but is, in fact, “not contrary to economic rationality as such” (Bouckaert *et al*, 2008: viii). Frugality is a global good, “a necessary condition for global sustainability and intergenerational justice” in the world of the twenty-first century, so the authors (Bouckaert *et al*, 2008: viii). Frugality is then promoted as an ideal, a lifestyle based on “low material consumption and a simple lifestyle” (Bouckaert *et al*, 2008: 3).

In this section, we have pointed to the historical role of the concept of frugality since ancient times. We have briefly highlighted its role in ancient Western and Eastern societies, during the European Enlightenment and in relation to early economic debates, and since the industrial revolution. Given the scope of this matter, this section only intended to raise awareness and to offer a few insights into the historical role of frugality. We suggest attending further research to explore the complex history and geography of frugality and economic activity in greater detail.

3. Theoretical Context of Frugal Innovations

This section deals with the investigation of the theoretical base of frugal innovations. Before going into relevant theoretical considerations it is, however, necessary to understand the semantics of this term, which consists of two words. In its dictionary meaning[6] the word “frugal” is an adjective that denotes characteristics of being “economical in use or expenditure; prudently saving or sparing; not wasteful; entailing little expense; requiring few resources”. It is derived from Latin *frūgālis* that implies being economical and can be broken into two parts (a) *frūg-* (stem of *frūx* produce, fruit) + -*ālis* (pertaining to). Therefore, it can be also interpreted as being juicy, healthy or useful. Its dictionary antonyms are “wasteful; extravagant; luxurious; lavish”, whereas economical and thrifty are its synonyms. Frugal, economical and thrifty all “imply careful and saving use of resources”, e.g., prudent planning

[6] See, http://www.dictionary.com/browse/frugal?s=t, last retrieved: 14.02.2016.

in the disposition of resources so as to avoid unnecessary waste or expense. "Innovation" in its dictionary meaning refers to "introduction of new things or methods".[7] For the purpose of this study we define innovations, in keeping with the Oslo Manual, as "the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organisation or external relations" (OECD, 2005: 46).

The term "frugal innovation" being a relatively recent phenomenon does not, as yet, have a single, widely accepted definition. In the following we showcase a few published definitions that have been also adopted, to some extent, in the scientific community:

"It is not simply about reducing cost, but can also involve increasing the affordability power of the buyer through income generation, saving, or alternative payment schemes. Frugal innovation may also mean that the outcome involves building local entrepreneurship, capacity building and self-reliance or sustainability" (Bhatti, 2012: 18).

"[F]rugal innovations are not re-engineered solutions but products or services developed for very specific applications in resource constrained environments" (Zeschky, Winterhalter, and Gassmann, 2014a: 23).

Frugal innovations can be characterized as "new or significantly improved products (both goods and services), processes, or marketing and organizational methods that seek to minimize the use of material and financial resources in the complete value chain (development, manufacturing, distribution, consumption, and disposal) with the objective of significantly reducing the total cost of ownership and/or usage while fulfilling or even exceeding certain pre-defined criteria of acceptable quality standards" (Tiwari and Herstatt, 2014: 30).

"Frugal innovation is the ability to 'do more with less' – that is, to create significantly more business and social value while minimizing the use of diminishing resources such as energy, capital and time" (Radjou and Prabhu, 2015: xv).

These definitions show that the term "frugal innovation" has been used to refer to a very broad range of innovative solutions, from social innovations by non-profit organizations up to for-profit products aimed at the poor, and from grassroots entrepreneurs in the informal

[7] See, http://www.dictionary.com/browse/innovation?s=t, last retrieved: 14.02.2016.

sectors of rural areas in the developing countries to highly formalized product development by multinational corporations (MNCs) targeted at price-sensitive customers. Nevertheless, the scholarly discourse so far has been rather on the practical sides of the phenomenon (“what”, “why”) so that only few scholarly works have tried to provide a theoretical base (“how”) to it (see, e.g., Bhatti, 2012). In this section we present the result of an in-depth literature review to first examine the origins and perception of frugality in scholarly discourse and then to identify the streams of thought leading to frugal innovation. Finally, we briefly differentiate between terms that are often used synonymously by some.

3.1. Frugality in Political Economy

The use of (synonym) nouns “thrift” and “frugality” and adjectives “thrifty” and “frugal” can be traced back in the economic thought right up to the works of Adam Smith, the founding father of political economy. Praising frugality in his *Wealth of Nations* Smith wrote, “[.] the credit of a frugal and thriving man increases much faster than his stock” (Smith, 1776: 131). At another place he saw frugality as one of the preconditions to raise the standard of living:

> “[.] a workman, even of the lowest and poorest order, if he is frugal and industrious, may enjoy a greater share of the necessaries and conveniencies of life than it is possible for a savage to acquire” (Smith, 1776: IX).

All in all, there are 38 references to frugality in this work pointing to the great emphasis that he put on it as a core value in business enterprises and private lives of his day. Smith saw frugality as a golden middle-path that allowed efficient and effective use of resources in life, as can be seen in this statement in his *Theory of Moral Sentiments* (Smith, 1759: 274):

> “[..] the virtue of frugality lies in a middle between avarice and profusion, of which the one consists in an excess, the other in a defect of the proper attention to the objects of self-interest.”

Also neoclassical economists like Alfred Marshall (1842-1924) continued to see thrift/frugality as a positive characteristic. In a specific context he mentioned, "thrift and the knowledge of practical details" in combination with industriousness as key to success (Marshall, 1890: 309). He too placed thrift in the middle of the two extremities, extravagance and miserliness (Marshall, 1890). While Marshall criticised the “wastefulness that is found now among some classes in our own country”, he also warned against miserliness as a barrier to economic growth and hampering the standard of living (Marshall, 1890: 225). Interestingly, Marshall saw institutional arbitrariness, e.g., in matters of taxation, leading to a loss of frugality in society, as people would rather not prefer to save and accumulate wealth, which might be taken away (1890: 734). Similarly, he mentioned poor law and order as well as too-liberal welfare policies causing negative incentives for a frugal living (Marshall, 1890: 226).

Summing up, it can said that a *healthy* frugality in daily life was considered virtuous, which contradicts the negative connotation it seems to have basically acquired in the post-war period of the 20th century, when aspiration for "ever-bigger and better" solutions and the quest for unending growth in the face of saturated markets in the economically developed world led to practices like planned obsolescence (Slade, 2007; Brown and Vergragt, 2015).[8] Early calls to return back to a more "prudent" way of living were given in the 1970s (Meadows, Meadows, Randers, and III., 1972; Schumacher, 1973) as discussed in section 2. Such calls produced mixed results, as on the one hand, ecological awareness spread and green movements were initiated around this time. On the other hand, the quest for "big solutions" has remained undiminished in the social discourse, with even developing economies trying to emulate the innovation ideal of the west, for example in preferring large-scale infrastructures over small-scale solutions.

Recent research in marketing and innovation management, nevertheless, suggests setting in of a "feature fatigue" in consumers (Thompson, Hamilton, and Rust, 2005), and a growing demand for reduction in the "needless complexity layered on to technology-based products" (Hanna, 2012: 352). This is at least true for many (affluent) consumers, especially in the developed countries, who opt for frugality out of choice (see, e.g., Herstatt, 2015). Therefore, this cannot be construed as being "simplistic" or "less demanding". As Hanna (2012: 352) points out, "Simplicity is the result of logic and empathy, and it is deceptively hard to achieve".

3.2. Frugality in other disciplines

Many people interpret frugality today as the opposite-pole of luxury or the supposedly best-possible solution. However, as shown earlier, frugality can be seen as a golden middle-path that strives for the most efficient and effective use of resources in life. This line of thought is shared by several other disciplines. For example, modern-day psychology often seeks to employ "fast and frugal heuristics". Scholarly research "has shown that quite simple, psychologically plausible mechanisms of inference and choice are, in certain reasonable

[8] The big depression in the 1930s also played a key role in a deliberate promotion of consumerism and of planned obsolescence (see, e.g., London, 1932).

environments, capable of surprisingly good performance" (Connolly, 1999: 480). This goes right up to the discussion on ethics and consumer psychology. According to Chancellor and Lyubomirsky (2013: 133), *thrift,* with its semantic roots in *thrive,* at its essence, "is about the best, most efficient use of limited resources." They relate "unrestrained materialism" with "numerous costs for the society and the individual". As a matter of fact, Germany in recent years has seen works that have tended to critically question the paradigms of a consumption-driven society (von Schönburg, 2006; Welzer, 2013) and that of economic growth and innovation (Paech, 2012a; b; Welzer, 2013).

In the field of sociology and anthropology, too, thrift/frugality has received significant scholarly attention. Societies have been observed to display varying preference in how they respond to human needs & desires: by (immediate) gratification or by restrain & postponement, which can, in turn, have significant impact on a given culture, personality or social system (see, e.g., Schonberger, 1987: 80 pp.). In Hofstede's model of cultural dimensions, this preference impacts at least two dimensions: short-term vs. long-term orientation; and indulgence vs. restraint, as societies that display a long-term orientation and/or that are more inclined towards restraint tend to display greater acceptance of thrift/frugality as a value (Hofstede, Hofstede, and Minkov, 2010). Anthropologists have long used the term "bricolage" to refer to the practice of dealing with resource-constraints (Levi-Strauss, 1966). Bricolage can be understood as "making do with current resources, and creating new forms and order from tools and materials at hand" (cf. Baker, Miner, and Eesley, 2003).

Another discipline which shows a noteworthy connection to frugality is engineering sciences resulting in discussions on the use of frugal practices in manufacturing (Schonberger, 1987) and product design. Pisano and Wheelwright (1995) highlighted the role of process technologies in creating innovations efficiently and with a significant cost advantage. Some researchers, e.g. Kauppinen *et al* (2007), have also warned of overuse of product features that "oversatisfy" customer needs and can lead to price-based competition. They have called for better integration of "requirement engineering" into the process of new product development. This line of argumentation is supported by a study by Kus *et al* (2011) that investigated the impact of increasing price-sensitivity and thrift in consumer behaviour on "design-decisions", e.g. range of product features, choice of materials and targeted volume. The study found that amongst other measures manufacturers were changing to reduced embellishment, simplification and introduction of generic designs while updating technologies in order to "provide premium service and quality at an affordable price". Several recent scholarly publications from engineering disciplines suggest that high-tech-based frugal innovations are being seen as a key to develop solutions that can help raise the standards of living, improve healthcare or protect environment while ensuring affordability (Reardon, 2013; Baekelandt, 2015; Btatkeu-K., Tchatchueng, Noubactep, and Care, 2015; Davidson, Newton, Tankumpuan, G.Paull *et al*, 2015; Reynders and Baekelandt, 2015; Urpelainen, 2016).

Summarizing for this section, we might conclude that while the explicit and intentional integration of frugality into the practices of innovation management is a relatively recent phenomenon, the scholarly discourse on frugality taken for itself is not new and has multiple facets that transcend boundaries of several disciplines in the humanities, social & economic sciences as well as engineering, as depicted in Figure 1.

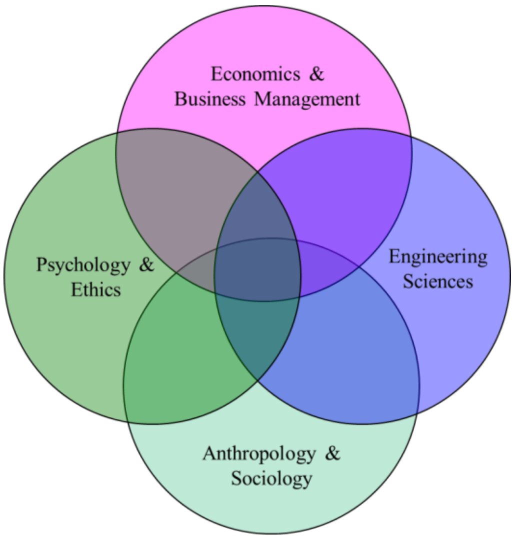

Figure 1: Frugal innovations as an interplay of various disciplines[9]

3.3. Frugal Innovation in Management Sciences

Even though frugality has been present in scholarly discourse for a very long time,[10] the term "frugal innovation" is rather new and its first appearances in scholarly management discourse can be traced back to the last years of the previous decade. Business magazine *The Economist* can be seen as one of the pioneers who *explicitly* combined frugality with innovation, when it

[9] Source: own construction. The figure shows only the main sources of influence on the scholarly discourse of frugality. Other related discussions, such as on environmental and social sustainability, are themselves of multidisciplinary nature and are seen to be subsumed by these overarching disciplines.
[10] According to Gemünden (2015: 4), "[t]he desire to get more with fewer resources is an evergreen of management research and practice".

published an article titled *Health care in India: Lessons from a frugal innovator* (Economist, 2009).

In those years it was often the business press, which highlighted the emergence and the subsequent spread of this phenomenon in the emerging economies like India (see, e.g., Bellman, Misquitta, and Glader, 2009; Economic Times, 2010; Economist, 2010; Lamont, 2010a; Sehgal *et al*, 2010).[11] Subsequently this phenomenon caught attention of management researchers and scholarly articles started to be published (see, e.g., Herstatt, Tiwari, Ernst, and Buse, 2008; Fukuda and Watanabe, 2011; Zeschky *et al*, 2011; Bhatti and Ventresca, 2012; Bound and Thornton, 2012; Radjou, Prabhu, and Ahuja, 2012; Tiwari and Herstatt, 2012b; Rao, 2013).

As Figure 2 suggests, there has been a rapid increase in the number of scholarly publications on the topic of frugal innovations. While Google Scholar had almost no publications with this keyword at the end of 2009, their number had crossed the mark of 900 scholarly articles by the end of 2015, and then registered an exponential growth, reaching the mark of 1,490 by mid-July 2016. It seems that the concept has now reached a critical mass which is creating a self-reinforcing virtuous cycle.

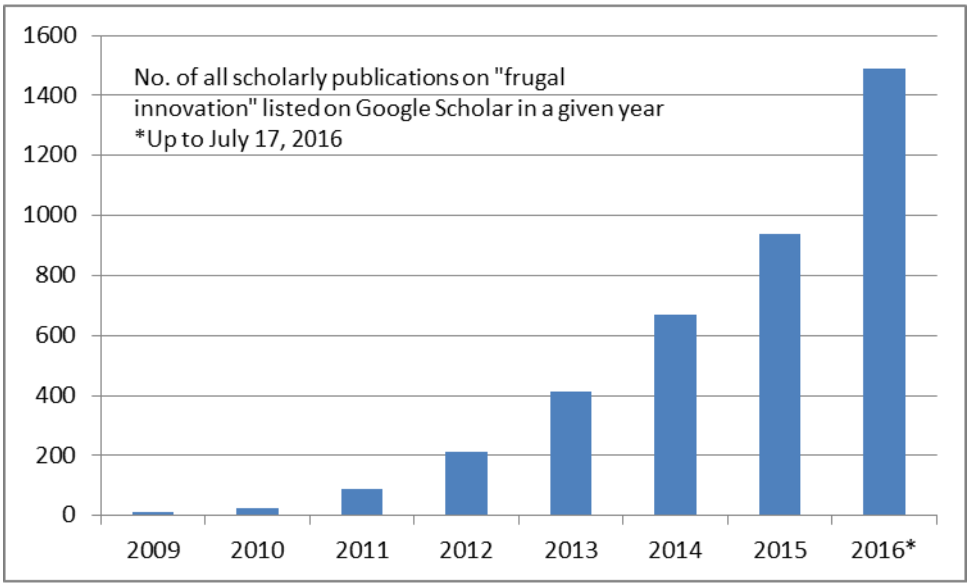

Figure 2: No. of all articles on Google Scholar for the term "frugal innovation" at year-end

[11] In many instances these developments were also an indirect result of the globalisation of R&D that started in the 1990s and picked up pace in the first decade of the new millennium (Gerybadze and Reger, 1999; Archibugi and Pietrobelli, 2003; Ernst, 2006).

For the purpose of identifying key sources of scholarly influence, we identified 146 journal articles with thematic relevance to the evolution of the concept of frugal innovations. Bibliometric references cited in these articles (numbering 6,165) were entered into a database. A preliminary analysis showed that the most often cited author was C.K. Prahalad, who has been one of the key influences in establishing the research on the "Bottom of the Pyramid" (see, e.g., Prahalad, 2005). Table 1 gives an overview about those authors and their fields of research who were found to have been cited more than 25 times in the sample:

Rank	Author	Key research field	Times cited (citation frequency)
1	C.K. Prahald	Bottom of the Pyramid	76 (52%)
2	V. Govindarajan	Reverse Innovation	56 (38%)
3	C.M. Christensen	Disruptive Innovation	53 (36%)
4	S . Hart	Bottom of the Pyramid	44 (30%)
5	(The Economist)	Emerging Markets	43 (30%)
6	J. Prabhu	Jugaad/Frugal Innovation	36 (25%)
7	M. Porter	Strategic Management	30 (21%)
8	C. Herstatt	User/Frugal Innovation	26 (18%)

Table 1: Most cited scholars (with >25 citations) in the dataset[12]

Based on the results of Table 1 frugal innovations seem to be closely linked with concepts such as "Bottom of the Pyramid" (BOP), "disruptive innovation" and "reverse innovation" but cannot be defined by any single one of them, as explained below:[13]

While BOP, per definition itself, refers to the poor as target consumers and focuses largely on B2C markets (Prahalad, 2005), frugal innovations can be targeted at customers in any segment of the economic pyramid, who may be price-sensitive by choice or merely seek "simpler" products having a better fit to their actual needs. They may also be demanded by customers in both B2B and B2C segments due to price pressures or out of ecological conviction.

Reverse innovation refers to products and services that are initially created in the emerging economies for local markets but later find diffusion in the developed world (Govindarajan and

[12] Source: Own analysis; provisional results.
[13] As regard to other terms in Table 1, the link of frugal innovation to "user innovation" shows that the former can often be created by end-users and do not necessarily have to be generated in formal, firm boundaries. The link to "strategic management" as well as "emerging economies" is more in respect of their relevance in the corporate strategy. These terms are not used as synonyms to refer to this type of innovation.

Trimble, 2012). This concept has some similarities to the recent "lead market" research, which has observed emergence of pioneer markets in the emerging economies due to their large volumes and technological competencies (Tiwari and Herstatt, 2012a; Quitzow, Walz, Köhler, and Rennings, 2014; Quitzow, 2015). However, we find instances of frugal innovations taking place both in the developed and the developing world – with or without international diffusion.

Frugal innovations are often characterized by disruptiveness[14] (Rao, 2013; Ramdorai and Herstatt, 2015). Nevertheless, "frugal innovations can [also] have a sustaining effect for the business of an incumbent already engaged in serving [a particular] customer segment" (Tiwari and Herstatt, 2014: 30). There have been several instances of firms, e.g. the Tata Group and Maruti Suzuki in India, that have long used frugal innovations to create a sustaining effect on their respective businesses.

The Hindi-language term "जुगाड़" ("Jugaad", sometimes transliterated into the Roman script also as "Jugad", "Jugaar" or "Jugar", and often translated into English as "improvisation") has been used by some to refer to products and services that we characterize as being frugal (see, e.g., OECD, 2009; Menon, 2011; Radjou *et al*, 2012; Hesseldahl, 2013; Holtbrügge, 2013). A problem with this approach, however, is that semantically the term Jugaad is derived (via "Jugat" and Jugati") from "Yukti" in Sanskrit (Prasad, Sahay, and Shrivastav, 2000) that first of all refers to a method/means and not to an outcome; second it can also employ use of a "trick" or "cunning device" (Monier-Williams, 1899). The term Jugaad in its original usage in India refers to non-standard improvisations as an immediate solution (see, e.g., Tully, 2011). However, this might not be a quality solution and might not – in some instances – fulfil the criteria of legality (Krishnan, 2010; Birtchnell, 2011). The term Jugaad, therefore, appears inappropriate for referring to solutions that enable "affordable excellence"[15] and fulfil all quality norms and standards.

3.4. Defining Frugal Innovations

Due to such considerations we propose the following working definition of frugal innovation, which does not limit this phenomenon to specific geographic areas or income groups on the

[14] For concept of "disruptive innovations", see, e.g., Christensen and Raynor (2003)

[15] (Mashelkar, 2014); some researchers also refer to it as "low cost-high tech" (see, e.g., Schanz, Hüsig, Dowling, and Gerybadze, 2011).

one hand, and puts emphasis on ensuring acceptable quality standards by adhering to all regulatory norms, on the other:

Frugal innovations seek to create attractive value propositions for their targeted customer groups by focusing on core functionalities and thus minimizing the use of material and financial resources in the complete value chain. They substantially reduce the cost of usage and/or ownership while fulfilling or even exceeding prescribed quality standards.

Key characteristics of this definition may be summed up as follows:

- By focusing on core functionalities and minimizing the use of environmental resources and factors of production frugal innovations attain an in-built sustainability component across the entire value-chain and should lead to "responsible innovation"[16];
- Frugal innovation should substantially reduce not only the price at the point of purchase but during the entire cost of usage/ownership, thus it also includes principles of "sharing economy"[17];
- Most importantly, this definition frees frugal innovation from the notion of static customer segments and turns it into a dynamic tool. Frugal products and services can be produced for any group of consumers by substantially increasing affordability and opening up a new segment relative to any specific price/performance point.

This working definition was used for the workshop that was organized to validate the initial findings and generate some primary data. The workshop and its results are described in the next section.

4. Evaluation of workshop results

The workshop was directed at researchers, practitioners and political actors interested in the phenomenon of frugal innovation. [18] Altogether 30 stakeholders with diverse backgrounds in management, science and politics assembled to discuss research results on frugal innovations and its relevance for German companies as well as the German society. Aim of the workshop

[16] For "responsible innovation", see, e.g.: (Wood, Pitta, and Franzak, 2008; Bogner, Decker, and Sotoudeh, 2015)
[17] For "sharing economy", see, e.g. (Belk, 2014)
[18] The workshop was held in Hamburg on January 12th, 2016 as an initial part of this BMBF-supported study.

was to summarize research findings and collect new insights about the perceived relevance and potential of frugal innovations by stakeholders in Germany.

4.1. Questionnaire

At the beginning of the workshop a questionnaire was distributed to the participants of the workshop. The intention was to capture their view of frugal innovation and its potential at the beginning of the workshop in order to compare this result with the outcome of the focus group discussions held at the end of the workshop.

The questionnaire covered the understanding of the term frugal innovation, the relevance of frugal innovation in different contexts, challenges concerning the diffusion and implementation of frugal innovations as well as personal interests of the participants concerning the topic and their broader societal view. Furthermore, we collected some attributes of the participants as areas of their experience with frugal innovation and their professional background. Answers were mostly collected via a 5 point Likert scale. In our scale, 5 equals full agreement, 3 is a neutral answer and 1 stands for total disagreement. We received 21 complete questionnaires.[19] Most of the respondents (13) were representatives of the business world, four of the respondents were scientists and three had a political background.

The average answers of all participants concerning the primary attributes of frugal innovation are displayed in Figure 3.

[19] Among the participants 6 belonged to the project team. These did not participate in the survey in order not to influence the survey outcome by their own opinions/perceptions.

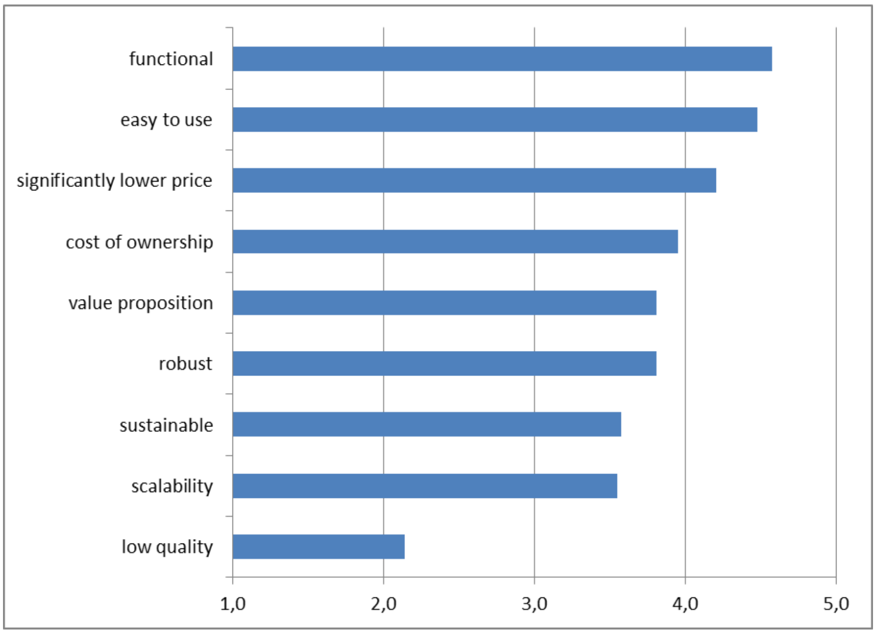

Figure 3: Primary attributes of frugal innovation

As expected all suggested characteristics are seen as relevant, except for the item low quality that was included to check negative associations. The three most relevant characteristics are the functionality of the product, an easy use as well as a significantly lower price compared with similar products. Slight differences could be identified if the answers of persons from business, science and politics were separated. For instance, the three participants with political background put more emphasis on the "cost of ownership" instead of the significantly lower price when purchasing the product.

The answers of the participants to the question "How relevant are frugal innovations for Germany with respect to …" are displayed in Figure 4.

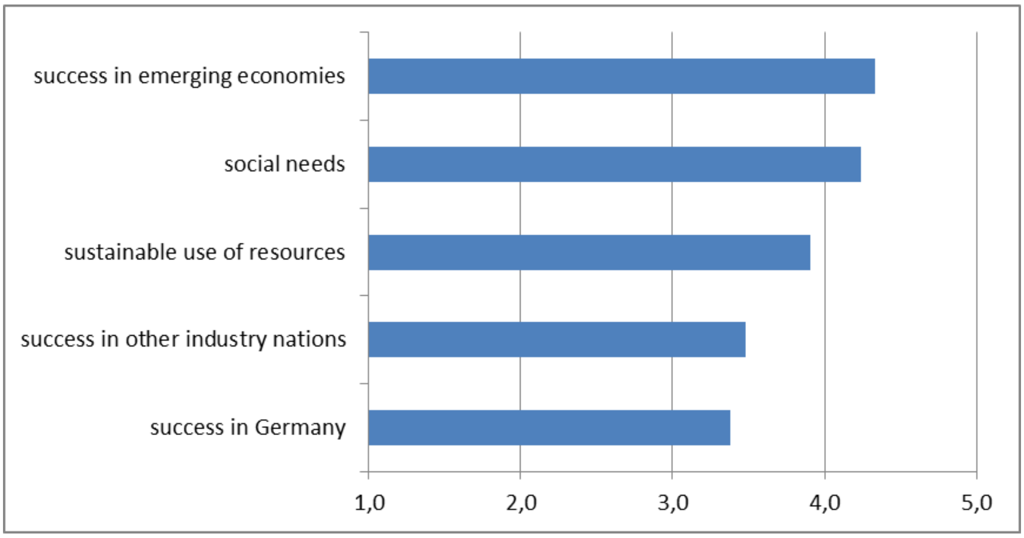

Figure 4: Relevance of frugal innovation for Germany

At the beginning of the workshop, participants only slightly agreed on the relevance of frugal innovations with respect to business success in Germany or other industrial nations. However, relevance is seen for the success of German companies in emerging economies, for fulfilling social needs concerning the supply with affordable products and services as well as for the use of sustainable resources.

Challenges associated with frugal innovations from a business perspective are displayed in Figure 5. Participants agreed that challenges could be expected concerning the adaptation of innovation processes, the identification of customer needs as well as resistance in the management. Additional challenges could be added in the questionnaire. Four respondents addressed here cultural challenges in generating frugal innovations. Responsible engineers need to mentally adopt the goals of frugal innovation. Only if they overcome their tendency to develop complex technologies and if the entire company appreciates frugal innovations, will companies succeed with this new innovation model. Another respondent addressed regulatory challenges imposed by legislation.

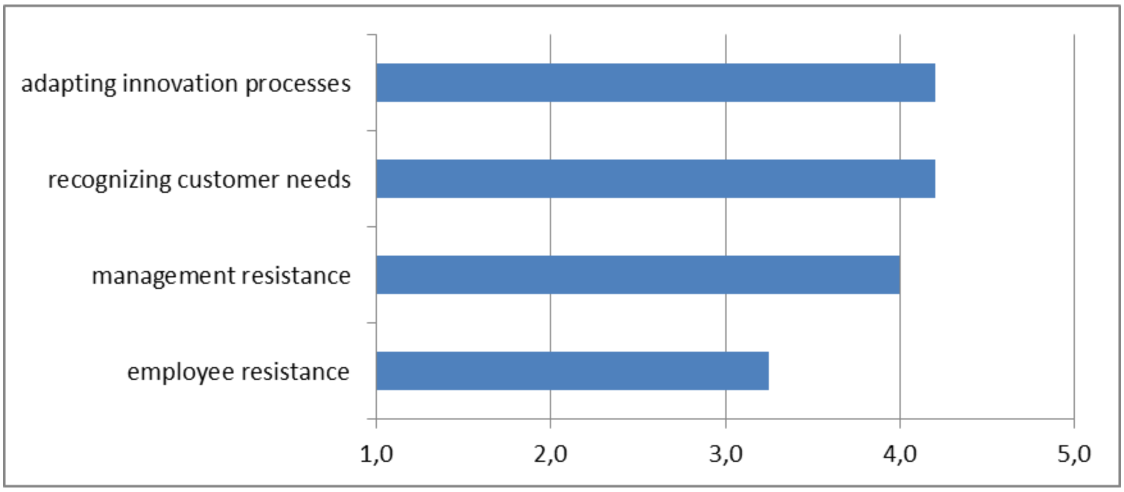

Figure 5: Challenges of frugal innovation from a business perspective

At the end of the questionnaire we asked about special interest topics from a personal as well as from a social point of view. New points mentioned in the personal section were frugal services, e.g. in health-care or banking and the marketing of frugal products. Looking at frugal innovation from a social perspective, four respondents mentioned sustainability goals that could be reached by frugal innovation. Another topic addressed is education in frugal practices starting from school-level and reaching to best practices in engineering. Furthermore, twice the question was raised, if consumers in Germany would accept frugal innovations and one respondent asked how the innovation potential of emerging economies could be used for society.

Altogether, all participants of the workshop already had an understanding of frugal innovation; six people even have dealt with frugal innovations for five years or longer. The most relevant characteristics of frugal innovations could be identified and all participants agreed on the relevance of the topic for German companies. However, the relevance of frugal products for the domestic German market is not clear yet. Challenges are seen in innovation management and marketing, but also in cultural changes needed to adopt a frugal mind-set.

4.2. Focus Groups

After being presented the research results on frugal innovation including a historical analysis, a scientific analysis and a discourse analysis based on German media,[20] the participants of the workshop discussed frugal innovation in three focus groups. Each focus group represented a mix in age and disciplines. The participants ranged from young students to above 70 years old and covered occupations in science, business and politics. Results were captured on flipcharts and later presented to and discussed with the whole audience.

4.2.1. Focus Group 1

In the first focus group the relevance of frugal innovations for German companies in the domestic market was discussed. Participants of the focus group raised at the beginning the question, if Germany could be a pioneer in frugal innovation and which strengths of German companies and the German society would be supportive to foster frugal innovation in Germany. Hence, the group tried to identify strengths of German companies needed to deal with the challenge of frugal innovation. It was pointed out that frugal innovation should be addressed within a "holistic business ecosystem" and cover management, strategy as well as cultural aspects. Especially for the German market, the sustainability aspect of frugal innovations should be emphasized. In this context, "the total impact on life" of frugal products needs to be addressed in the innovation process as well as in marketing. An advantage of German engineers was seen in their creativity to think differently. Also it was suggested that in Germany one can find a special consumer consciousness fostering the acceptance of frugal products if these are "simple" (-> easy to use) and sustainable following the paradigm "less is more". Perhaps, frugality can establish a trend life style in Germany. Examples of frugal innovations especially suitable for the German market were seen in

[20] See sections **Fehler! Verweisquelle konnte nicht gefunden werden.**-3 of this paper.

services in general as well as in the healthcare system. Overall, a definite and increasing relevance of frugal innovations for the German market was identified and agreed upon.

4.2.2. Focus Group 2

The second focus group dealt with the relevance of frugal innovations for German companies in a global context. Topics of interest were seen in organisational issues as well as in change processes needed to develop and implement a frugal innovation culture. Discussion in the group included: (a) synergies between frugal innovation and "industry 4.0", (b) the role of global open/user innovation to address market needs in emerging economies, and (c) the education of German engineers. A need was identified to train prospective engineers in "high end" vs. "design to cost". As global competition should be state of the art for all German companies there is no way to ignore the trend of frugal innovation. Three business sectors were identified by the group as having potential for frugal innovations: education, health-care and banking. Hence, again the issue of frugal services was addressed. However, processes to develop frugal innovations still need to be identified and improved. How can the local knowledge of foreign markets be best combined with the high engineering competences in Germany? Altogether, the group determined a high relevance of frugal innovations for German companies in a global context.

4.2.3. Focus Group 3

The third focus group addressed socio-political implications of frugal innovation for the German research and innovation system. The overarching agreement amongst the members of the group was that frugal innovation is relevant, present across all generations in Germany and shall be of greater importance in the future due to an ongoing trend towards greater moderation and simplicity. More precisely, frugal innovation was assigned great importance in ensuring social participation and sustainable production and consumption in order to move away from a throw-away society and towards a collecting society. Removing superfluous elements and moving away from technological messiness were given importance.

The role of the social status in relation to consumption and a potential conflict between individuality and product development were mentioned as potential challenges together with the role of research and education. The participants suggested initiating a product life cycle management that was more based on "cradle to cradle" – including product design. That implied, in the opinion of the participants, higher education that taught engineering, product development, marketing and design based on the motto “design for use” and on a better understanding of society and the market.

4.2.4. Summarizing Results of the Focus Groups

Before the workshop, participants mostly associated frugal innovation with emerging economies. In their opinion, primarily companies striving for success in these regions needed to address this topic. Otherwise, relevance of frugal innovations with respect to business success in Germany or other industrial nations was still questioned.

Based on the presented research findings and plenum discussions, a mind-shift could be observed in the focus groups. The group addressing socio-political implications of frugal innovation for the German research and innovation system (focus group 3) agreed on the high relevance of frugal innovations for the German society. Similarly, the first focus group positively assessed the possibility that frugality could establish a trend in Germany. In both groups this relevance of frugality for Germany was linked to sustainability goals and the establishment of a circular economy. This combination points to “frugal innovations” also being seen as “responsible innovations” in the German context. Furthermore, as was discussed in focus group 2, global competition is reality for all German companies, hence, frugal innovations should also be considered as a global challenge affecting everyone.

Based on answers collected via questionnaires and discussions held during the workshop, several aspects of frugal innovations could be identified that need further research attention. For example, the design of frugal services or the marketing of frugal products in a wide range of customer groups are interesting topics that have been neglected so far. Finally, motivating German engineers and managers to adopt a “frugal mind-set” as well as to design frugal innovation processes are still challenges to be resolved.

5. Conclusions

The discussion above shows that frugal innovations are a necessary by-product of frugality that is increasingly shaping our world even if its roots in the developing and the developed world are somewhat different. While there is a growing-but-still-limited prosperity in the emerging economies allowing many customers in the B2B and B2C segments for the first time to acquire (access to) better-quality products, many customers in the industrialized nations feel the need to adopt “simpler” products. In some cases it may be the financial incentives that influence this decision, but in some others they are also guided by a desire to reduce complexity and preserve the environment. Since natural resources are depleting, many stakeholders in business, research and politics expect the trend of frugality to get stronger in the medium run, as shown in section 4.

The increasing demand for frugality/simplicity acts as a root cause for the development and diffusion of frugal innovations. This trend is, thus, not only true for companies striving for business success in emerging economies, but also increasingly for the future of the (German) society itself. The historical analysis in sections 2 and 3 has revealed that frugality – for long periods of civilized life – has been a respected and popular virtue which only lost its place in the post-war era of prosperity when saturated societies started to seek new avenues for continued economic growth, sometime on the cost of prudence.

At the end of the last decade, however, frugal innovation practices in the emerging economies, such as China and India, started to re-appear and were highlighted by the business press. The relevance and value of frugal innovations are reflected not only in an increasing research interest by scholars but also by other societal stakeholder including managers and policymakers. Nonetheless, as of today, many questions remain unanswered. For example, how small and medium-sized companies can develop frugal business models if they cannot take recourse to economies of scale or if they cannot set up R&D centres in the emerging lead markets in the developing countries; or how firms can cultivate the necessary mind-sets and corporate culture motivating product developers to innovate frugally and not value their product merely by the price-tag it commands.

Further interdisciplinary research is needed to answer most of these questions and to evaluate opportunities and challenges associated with frugal innovations for the various relevant stakeholders in society. As a next step, this project will seek to identify innovation paths and trajectories that foster or hamper the emergence of frugal solutions by studying the auto component industries in India and Germany. The essence of this paper, however, can be probably stated best in the following words of Schonberger (1987: 95):

“Frugality is not the virtue of some bygone era; it pays today too”.

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