

Beyond Traditional IT-enabled Innovation: Exploring Frugal IT Capabilities

Research-in-Progress

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Abstract

Innovation programs in developed economies are centered on resource richness and abundance. As firms seek newer innovation paradigms to sustain competitive advantage, we suggest the use of “frugal innovation”, which originates in emerging economies and is rooted in low cost approaches, constrained resources, and flexible improvisation. Frugal innovation principles when viewed from the theoretical lens of IT capability, RBV, and other related literature, can provide a rich foundation for frugal IT innovation research. In this exploratory paper, we explain the concept of frugal innovation and its position within a number of existing innovation paradigms. This is a significant contribution considering the number of emerging innovation concepts. We also demonstrate the potential integration of frugal innovation principles with traditional IT-enabled innovation approaches – a concept we call “frugal IT innovation”. We then explore potential “frugal IT capabilities” that may enable frugal IT innovation and finally provide propositions to guide future research.

Keywords

Frugal, IT-enabled innovation, IT capabilities, frugal innovation, business model innovation, social innovation, technology innovation

Introduction and Background

Innovation is the implementation of a new or significantly improved product, service or process; a new marketing method; or a new organizational method in business practices, workplace organization and external relations (Burns and Stalker, 1961; Rogers, 1998; OECD and Eurostat 2005, p. 46). Innovation can also be defined as the process of introduction of new ideas to the firm which result in improved firm performance (Burns and Stalker, 1961; Rogers, 1998). Firms often use “business model” innovation (Chan 2004; Chesbrough, 2007) for growth and performance improvement (Barua, Kriebel and Mukhopadhyay, 1995). With the rapid evolution of information technology, there have been tremendous advancements in IT-enabled innovation and organizational capabilities (Pavlou and El Sawy, 2010; Tanriverdi, Rai, and Venkatraman, 2010; Tallon, 2011; Wastell and McMaster, 2008). Despite such advances, organizations still face challenges in terms of converting technology innovations into viable business models due to cost overheads (Castro et al., 2011), intellectual property concerns (Helpman, 1992) and other operational issues (Rose et al., 2009; Stone et al., 2008; U.S. PTO, 2011). Furthermore, innovation solutions from the supply side (university research, partnerships, research and development centers, etc.) have increased, but due to risk-averse policies of businesses and their reluctance to adopt newer business models, there is a lack of demand-side innovation (OECD, 2011; Simpson, 2013). According to a recent OECD report (2011), governments are urged to “*seek ways to boost innovation without necessarily engaging in new programme spending, primarily to meet social demands*”. As a result, there have been several calls in both academia and industry to search for alternative approaches to innovation in order to ensure cost-effectiveness and meet societal and environmental demands.

In this paper, we explore the use of “frugal innovation” principles and approaches as a potential solution for the issues mentioned above. The practice of “frugal innovation” in emerging economies such as those of India, Kenya, Brazil and China, is rooted in low cost approaches, constrained resources, and flexible improvisation. The traditional paradigm for innovation is “fail fast, fix fast, learn fast”, while frugal innovation is based on “fail cheap, fail fast, fail often” (Radjou, Prabhu, and Ahuja, 2012). This distinction in the approach and implementation of innovation practices in resource-constrained environments can potentially lead to the emergence of new cost-effective innovation programs in various organizations. The six principles of frugal innovation are: seek opportunity in adversity, do more with less, think and act flexibly, keep it simple, include the margin, and follow your heart (Radjou, Piranha, and Ahuja, 2012). Nonetheless, challenges remain in establishing business models that can be enabled and supported by frugal innovation and combining frugal innovation with digital capabilities. Examples of frugal innovation in digital contexts are increasingly common, as shown in the following: salvaged electronic parts reconfigured and retrofitted to serve new functions such as medical screening devices and low cost projectors (Frugaldigital.org, 2013); the world’s cheapest mobile tablet device; and GE’s frugal “pay-per-use” pricing and just-in-time delivery model for radioisotopes providing affordable PET/CT scan equipment for cancer diagnosis in rural areas (Radjou, Prabhu, and Ahuja, 2011).

Senge (1997, p. 5) states that “any idea becomes innovation only when it can be replicated reliably in a meaningful scale at practical costs”. To that end, innovation approaches stemming from the grassroots in emerging economies need to be refined, scaled, and formally integrated with existing digital business frameworks in order to make them available for deployment in varied business contexts. Several examples in the extant literature also point in this direction: 1) an open innovation model in which firms draw on research and development that may lie outside their own boundaries (Chesbrough, Vanhaverbeke and West, 2008); 2) disruptive innovation at the low end of markets, including the opportunity to democratize products (Von Hippel, 2009) in emerging markets (Johnson, Christensen and Kagermann, 2008); 3) value co-creation (Prahalad and Ramaswamy, 2002) with efforts of corporate-NGO collaborations (Dahan et al., 2010) and living labs for open innovation in rural settings (Schaffers et al., 2010). Thus, combining business model innovation and frugal innovation practices can potentially provide cost-effective innovation solutions.

As we discuss frugal innovation in emerging economies, we must not forget that some principles of frugal innovation may already be practiced in developed economies, albeit for different reasons and using different terminologies. For example, at a recent IT Forum (CIO Brief, 2013), the Chief Technology Officer (CTO) of a major storage solutions provider which possesses a very mature innovation practice, announced that based on past results the company is purposefully **constraining budgets** of participants in their global innovation competitions as a means to promote “out of the box” thinking. This makes it evident that an important principle of frugal innovation is already being applied in IT organizations outside of emerging economies. It also highlights the fact that there is an underlying opportunity to study frugal innovation and attempt to generalize it to broader contexts than just emerging economies. This potential for generalization is gaining importance because the recent economic crisis has resulted in U.S. personal consumption expenditure dropping by more than three percentage points, while consumers in developed markets are becoming more value oriented, seeking simpler products and services that offer the greatest value (Zeschky, Widenmayer, and Gassmann, 2011). Thus, frugal innovation techniques may spark the interest of firms in developed markets.

Nonetheless, given the novelty of frugal innovation, it is safe to assume that even these organizations will be challenged to integrate traditional approaches such as managing using a resource-based view (RBV) of innovation (Barney, 1991; Bharadwaj, 2000; Mata, Fuerst, and Barney, 1995) and firm IT capabilities (Bhatt and Grover, 2005; Prahalad and Hamel, 1990), especially dynamic capabilities (Eisenhardt and Martin, 2000; Teece, 2007), with frugal innovation principles in an attempt to move towards a truly cost-effective innovation approach. For example, a case in point is that of Apple. Apple has been very successful in developed markets with “high price high margin” strategy for products and services. However, using the same strategy, Apple has not been successful in emerging markets (Worstall, 2013). This is likely because Apple failed to realize that consumers in emerging markets value affordability and are very sensitive to product pricing. Learning from these failures, Apple is now attempting to reframe its strategic position for emerging markets by embracing affordable products and aligning itself with several other market-specific demands (Mukherjee and Malviya, 2014).

Fortunately, there are some visible overlaps in traditional and frugal innovation approaches. For example, the ingenious human effort to transform adversity and scarcity can be linked to the skills of human resources (in adapting to adversity) from RBV and the principle of “think and act flexibly” suggests a quick response approach, which overlaps with dynamic capabilities and improvisation approaches. As these concepts are well established in the extant literature, drawing linkages to them provides a rich opportunity to develop new theoretical insights regarding frugal innovation which is enabled or driven by IT. Further examination of the frugal innovation approach is required in order to fully understand these linkages.

In this exploratory paper, we address the following research question: What is frugal innovation and what is the role of IT in frugal innovation? We answer this question by 1) presenting the concept of frugal innovation and its position within a number of existing innovation paradigms; and 2) exploring the potential integration of frugal innovation principles with traditional IT-enabled innovation approaches – a concept we call “frugal IT innovation” and 3) suggesting potential frugal IT capabilities that may enable or drive frugal IT innovation.

Frugal Innovation

Innovation programs in developed economies are centered on resource richness, availability, and abundance (Prahalad and Mashelkar, 2010). In contrast, innovating in developing economies is more challenging due to resource scarcity, lack of infrastructure, limited access to this infrastructure, and economic and financial constraints. Frugal innovation can be defined as “*not just a matter of exploiting cheap labor (though cheap labor helps). It is a matter of redesigning products and processes to cut out unnecessary costs*” (Wooldridge, 2010). In addition, cost is not the only factor that guides frugal innovation and there are other factors such as affordability, accessibility, availability, and sustainability (Radjou, Prabhu, and Ahuja, 2012; Varadarajan, 2011). But, the concept of frugal innovation itself is emergent and it is difficult to establish a theoretical foundation. However, a small number of ongoing studies are trying to define “frugal innovation” using perspectives from technology innovation, institutional innovation, and social innovation (Bhatti, 2012; Bhatti and Ventresca, 2012). Using this literature base, frugal innovation can be defined as “*one that redefines business models, reconfigures value chains and redesigns products to use resources in different ways and create more inclusive markets by serving users with affordability constraints, often in a scalable and sustainable manner*” (Bhatti, 2012).

Other current paradigms of innovation that somewhat resemble frugal innovation are: 1) Reverse Innovation, which refers to the case where an innovation is adopted first in poor (emerging) economies before “trickling up” to rich countries (Govindarajan and Ramamurti, 2011); 2) Inclusive Innovation, which is defined as knowledge creation and absorption efforts that are most relevant to the needs of the poor (Utz and Dahlman, 2007); and 3) Frugal Engineering, which is an overarching philosophy that enables product development where cost discipline is an intrinsic part of the process; however, rather than simply cutting existing costs, frugal engineering seeks to avoid needless costs in the first place (Tiwari and Herstatt, 2012). With respect to extending frugal innovation to IT-enabled innovation contexts, the principle of “frugal engineering” seems relevant and applicable. However, the focus on cost reduction and cost avoidance does not cover the entire breadth of frugal innovation principles, but it does lend support to the perspective that engineering and IT contexts are relevant for frugal innovation. Some other commonly used technology innovation paradigms originate from Schumpeter’s (1934) descriptions, such as product innovation, process innovation, new sources of supply, exploitation of new markets, new ways to organize business and “new combinations” of existing resources. Specifically related to IT, new methods for innovation include open innovation models in which firms draw on research and development that may lie outside their own boundaries (Chesbrough, Vanhaverbeke and West, 2008); disruptive innovation at the low end of markets, including the opportunity to democratize products (Von Hippel, 2009) in emerging markets (Johnson, Christensen and Kagermann, 2008); value co-creation (Prahalad and Ramaswamy, 2002) with efforts of corporate-NGO collaborations (Dahan et al., 2010); and living labs for open innovation in rural settings (Schaffers et al., 2010). Furthermore, innovative processes for software development such as AGILE (Highsmith and Cockburn, 2001) are focused only on increasing efficiency during turbulent changes in the development lifecycle and cost is a secondary consideration. Similarly, the concept of LEAN may resemble some aspects

of frugal innovation such as avoidance of non-essential costs, maintaining low overheads, and low resource inventories, but again LEAN is a methodology that helps firms create value through minimizing waste (Lean Enterprise Institute, 2014). Both AGILE and LEAN appear narrowly focused in comparison with frugal innovation, which is much broader and incorporates core strategic thinking regarding business, social, and technology issues.

Frugal IT Capabilities

Based on the above discussion, we can conceptualize frugal innovation as a combination of business, social and technology innovation. As shown in Figure 1, each of the three components is important in order to develop a “frugal innovation capability”, which when driven by IT can be classified as a “frugal IT” capability. A similar approach that classifies “digital eco-dynamics” as a combination of environmental turbulence, IT systems and dynamic capabilities was highlighted by El Sawy et al. (2010). Figure 1 is a simple illustration of this conceptualization that presents the case of Micromax, India’s second-largest selling mobile phone brand. The founder of Micromax recognized a business opportunity after he saw a payphone being charged by a truck battery in a rural area in India (Dharmakumar, 2010). Micromax developed mobile phones that do not need to be recharged for a month or longer (technology innovation) and focused on being frugal with costs such that the firm could target rural customers (business innovation). In doing so, Micromax developed the capability (either in-house or via partnerships) for longer-lasting batteries and for sourcing cheap components for its products, thereby offering its first flagship phone with 30 days of standby time for approximately 45 US dollars. It also established a dependable network of distributors in rural areas (social innovation) and set up manufacturing facilities in northern India, being the first mobile hardware company to do so (social innovation and business innovation). Today, Micromax is present in 12 countries and sells over a million handsets a month (Dharmakumar, 2010).

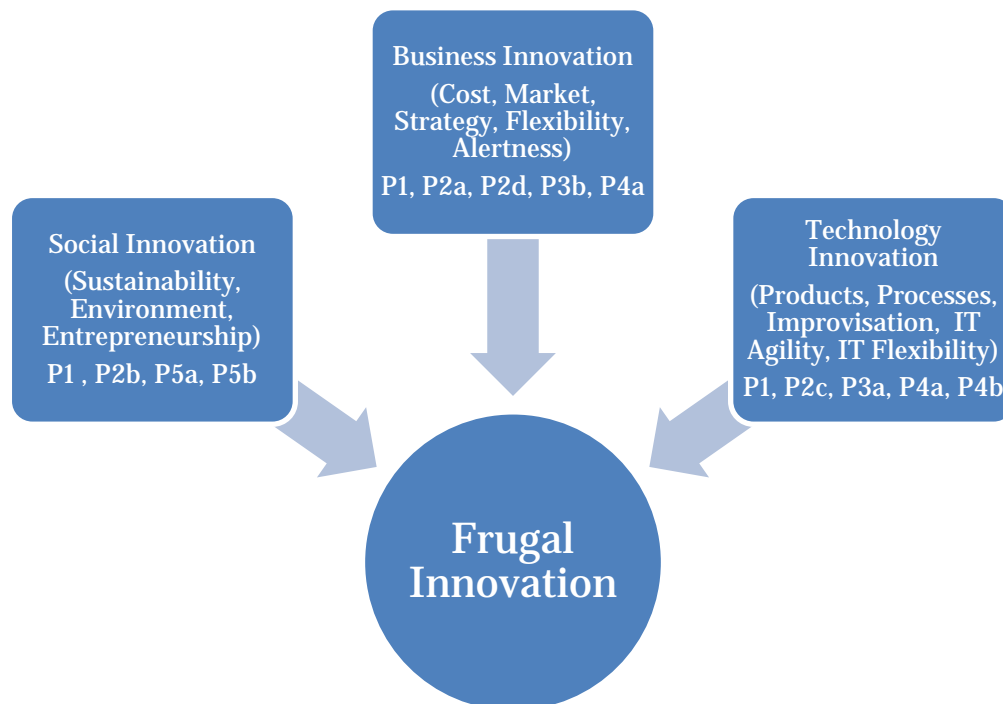


Figure 1. Conceptualizing Frugal Innovation

The above discussion leads to our first proposition:

P1: Firms engaging in simultaneous business, technology, and social innovation practices are likely to exhibit frugal IT innovation.

Our goal in this paper is to explore the development of these frugal IT capabilities. We therefore attempt to map underlying principles of frugal innovation to IT innovation concepts in the extant literature and

provide a roadmap for future research. In order to map the six principles of frugal innovation, firstly, we need to consider IT and digital contexts that may be applicable. Secondly, we must consider whether the concepts apply at the organizational or individual level or both. Some concepts may span multiple levels. Thirdly, we rely on literature from multiple theoretical domains such as RBV, IT capabilities, dynamic capabilities, IT innovation, knowledge management, and networks and alliances in order to explain the principles.

Principle 1: Seek opportunity in adversity

Radjou, Prabhu, and Ahuja (2012) prescribe ways for organizations to find opportunity in adversity. Table 1 maps each prescribed component to potential IT constructs and theoretical foundations. From a logical perspective, “seeking opportunity” points to a strong capability for “sensing” favorable market conditions. In the extant IT literature, sensing market opportunities is a dimension of the organizational agility construct (Park and El Sawy, 2013). Similarly, “seeking opportunity in adversity” can be considered an individual level phenomenon and maps to the construct of “entrepreneurial discovery” (Kirzner, 1997).

Principle Component	Potential Unit of Analysis	Potential IT Equivalent	Literature Source
Recognizing that the glass is always half-full	Individual and Organizational	Entrepreneurial Discovery	Austrian Economics (Kirzner, 1997)
Realizing extreme conditions are fertile soil for extreme innovation	Individual and Organizational	Uncertainty, Turbulence	Disruptive Innovation (Christensen, Baumann, Ruggles, and Sadtler, 2006)
Building psychological capital to boost resilience	Organizational	Knowledge Management Systems, Training, IT Human Resources	Knowledge Management (Chan, 2004)
Approaching big challenges with a growth mindset	Individual and Organizational	IT-enabled Innovation	Disruptive Innovation (Christensen, Baumann, Ruggles, and Sadtler, 2006)
Tapping the power of networks to tackle big market threats	Organizational	Alliance Networks	Alliances (Chesbrough et al., 2008)

Table 1. Mapping Components of Principle 1 to Theory

Previous studies have shown that innovative firms are entrepreneurial (Govindarajan and Ramamurti, 2011), sense market opportunities faster than their competitors (Park and El Sawy, 2013), use knowledge management systems extensively (Chan, 2004), and have strong alliances (Chesbrough et al., 2008). Within the context of frugal innovation, firms face the additional challenge of cost-effectively performing all of the above functions. Thus, firms need to be entrepreneurial as well as have strong alliances, and sense opportunities faster than rivals while re-using knowledge by deploying systems and developing learning capabilities. Even more challenging is the fact that using IT in order to achieve these goals can be expensive, thereby jeopardizing “frugality” entirely. Nevertheless, due to the rapid evolution of IT systems and supporting technologies, firms may be able to achieve frugal IT objectives. This is evident from a Forbes (2014) article on Silicon Valley firms which says “Silicon Valley is abuzz with excitement about low-cost startups. Building a company on open-source software and cloud computing is being hailed as a brilliant fusion of the Valley’s three great virtues—cheaper, faster and better. Take extra whacks at costs via social media marketing, crowd-sourced design and offshore engineering, and the perceived gains get even bigger. Estimates are that today’s most ambitious startups can take shape for \$100,000 or less, a mere one-tenth of the cost a decade ago”. Thus, we can develop the following propositions:

P2a: Firms displaying higher levels of sensing capabilities are likely to exhibit frugal IT innovation.

P2b: Firms that promote an entrepreneurial culture are likely to exhibit frugal IT innovation.

P2c: Firms that use knowledge management systems are likely to exhibit frugal IT innovation.

P2d: Firms that develop strong network alliances are likely to exhibit frugal IT innovation.

Principle 2: Do more with less

Radjou et al. (2012) prescribe a number of mechanisms to enable organizations to do more with less. An example of the use of this principle can be observed in the strategy used by Safaricom, the owner of the mobile payments platform M-PESA in Kenya. Safaricom sensed an opportunity to provide mobile payments via simple text messages in the Kenyan market as mobile phone penetration was much higher than landlines and banking services were not adequate. Using sophisticated IT systems and leveraging its existing telecom networking capabilities, M-PESA was offered as a service that could help solve both the banking and the payments problem and 68% of the adult population is today subscribed to M-PESA (Radjou et al., 2012).

Table 2 maps each prescribed component within this principle to potential IT constructs and theoretical foundations. The most interesting mechanism here is that of “being light on assets”. As mentioned earlier, traditional innovation approaches fail because firms often run into overhead expenses and higher resource maintenance costs. Within the extant IT literature, we can find references to IT flexibility (Rivard, 2004), IT adaptability (Tallon, 2008), and IT leveraging capability (Pavlou and El Sawy, 2010). Studies using these constructs suggest maintaining flexible and highly adaptable IT resources, systems, networks, and infrastructure that enable the firm to remain light on IT assets, which eventually increases innovation and firm performance. Studies also suggest that engaging in partnerships with vendors for outsourcing asset-intensive functions enables firms to maintain fewer IT assets (Rivard, 2004). Furthermore, studies also show that innovative firms use co-creation mechanisms in their value chains (Prahalad and Ramaswamy, 2002). Using similar arguments for frugal IT innovation, leads to the following propositions:

P3a: Firms displaying higher levels of IT flexibility are more likely to exhibit frugal IT innovation.

P3b: Firms engaging in value co-creation mechanisms are more likely to exhibit frugal IT innovation.

Principle Component	Potential Unit of Analysis	Potential IT Equivalent	Literature Source
Being resourceful in a resource-scarce environment	Individual and Organizational	Entrepreneurial Discovery	Austrian Economics (Kirzner, 1997)
Remaining asset-light	Organizational	IT Flexibility, IT Adaptability, IT Leveraging Capability (Pavlou and El Sawy, 2010)	RBV (Barney, 1991; Bharadwaj, 2000; Mata, Fuerst, and Barney, 1995); IT capabilities (Bhatt and Grover, 2005; Prahalad and Hamel, 1990)
Leveraging existing networks for distribution	Organizational	Innovation Networks and Alliances	Alliance Networks (Chesbrough et al., 2008)
Helping customers get more value	Organizational	Value Co-creation	Innovation, Marketing (Prahalad and Ramaswamy, 2002)

Table 2. Mapping Components of Principle 2

Principle 3: Think and act flexibly

Radjou et al. (2012) prescribe a number of means to enable organizations to do more with less. Table 3 maps each prescribed component to potential IT constructs and theoretical foundations. Organizational agility is defined as the capability of the firm to sense, analyze and respond to changing market conditions (Park and El Sawy, 2013). The key dimensions of agility are sensing, decision-making, and acting capabilities, with extensive use of IT systems. Improvisation is situated performance where thinking and

action occur simultaneously and on the spur of the moment (Ciborra, 1996) and improvisation capabilities when supported by IT increase innovation and firm performance. For example, New York Times (NYT) has successfully demonstrated its ability to act flexibly by providing dedicated space and time for its creative employees to experiment with radical new ideas. This resulted in heavy adoption of social media and digital platforms instead of continued investment in printed, non-digital products. Using this strategy, NYT has been able to attract new customers and perform better than its competitors and other news agencies (Radjou et al., 2012). Thus, using similar arguments for frugal IT innovation, leads to the following propositions:

P4a: Firms displaying higher levels of organizational agility are more likely to exhibit frugal IT innovation.

P4b: Firms displaying higher levels of organizational improvisation are more likely to exhibit frugal IT innovation.

Principle Component	Potential Unit of Analysis	Potential IT Equivalent	Literature Source
Include thinking the unthinkable	Individual and Organizational	IT-enabled Innovation	Disruptive Innovation (Christensen, Baumann, Ruggles, and Sadtler, 2006)
Improvisation	Organizational	IT Dynamic Capabilities (Eisenhardt and Martin, 2000; Teece, 2007)	Organizational Improvisation (Ciborra, 1996)
Multiple ways to reach a goal	Individual and Organizational	Entrepreneurial Discovery	Austrian Economics (Kirzner, 1997)
Agility	Organizational	IT Agility (Park and El Sawy, 2013)	Dynamic Capabilities (Eisenhardt and Martin, 2000; Teece, 2007)

Table 3. Mapping Components of Principle 3

Principle 4: Include the margin

“Including the margin” means to engage local communities and partners in setting up a grassroots value chain to locally build, deliver, and support their solutions – making these solutions in turn affordable, accessible, and sustainable (Rajdou et al., 2012). Table 4 maps each component of the principle to potential IT constructs and theoretical foundations. Kanter (1999) provides an illustrative example – “IBM began its Reinventing Education program in 1994 under the personal leadership of CEO Louis V. Gerstner, Jr. Today the program, designed to develop new tools and solutions for systemic change in public K-12 schools, operates in 21 U.S. sites and in four other countries. Many product innovations, which benefit both the schools and IBM, have resulted from this initiative”. If we consider the above discussion logically, any firm which seeks to optimize its human and financial resources, while at the same time building its innovation and learning capabilities, would engage in social innovation practices (Austin, Stevenson and Wei-Skillern, 2006). Thus, relying on social innovation, disruptive innovation and grassroots innovation literature leads to the following propositions:

P5a: Firms engaged in IT-based social entrepreneurship initiatives are more likely to exhibit frugal IT innovation.

P5b: Firms offering low-priced, affordable products and services to customers are more likely to exhibit frugal IT innovation.

Principle Component	Potential Unit of Analysis	Potential IT Equivalent	Literature Source
Co-create value with customers	Organizational	Value Co-creation	Innovation, Marketing (Prahalad and Ramaswamy, 2002)

Engage local communities	Organizational	IT Social Entrepreneurship	Social Innovation (Christensen et al., 2006)
Grassroots value chain	Organizational	IT Social Entrepreneurship	Grassroots Innovation (Utz and Dahlman, 2007)

Table 4. Mapping Components of Principle 4

Principle 5: Keep it simple and Principle 6: Follow your heart

We found the extant literature in this area to be very subjective and could uncover no relevant IT constructs.

In summary, we have attempted to conceptualize frugal innovation and position it within several existing innovation paradigms. Furthermore, we have explored each principle within frugal innovation and attempted to find relevant IT constructs that are potentially applicable for future research. We have mapped each component within each principle to relevant IT-based constructs and connected these to relevant literature sources in order to establish a foundation for the concept of frugal IT innovation.

Discussion and Future Research

As stated earlier, given the novelty of frugal innovation and lack of theory in the extant literature, organizations will be challenged to integrate traditional approaches such as managing using a resource-based view (RBV) of innovation and firm capabilities (especially dynamic capabilities) with frugal innovation principles in an attempt to move towards a truly “frugal IT innovation” paradigm. Interestingly, RBV theory has been criticised as being tautological and lacking relevance in dynamic business environments (Priem and Butler, 2001). Similarly, dynamic capabilities are criticised as being abstract and not contributing to sustained competitive advantage (Eisenhardt and Martin, 2000). Therefore, an alternative perspective of frugal innovation which is based on Austrian economics can be considered. This may lead to the characterization of frugal innovation as a part of the processes of “entrepreneurial discovery” and “knowledge gathering” (Kirzner, 1997). From an RBV lens, knowledge resources and knowledge management play a major role in supporting dynamic capabilities and achieving sustained competitive advantage (Eisenhardt and Martin, 2000) while some aspects of “entrepreneurial discovery” may be represented by skills and the competence of human resources.

Thus, future studies to develop newer theory for frugal IT innovation are needed to specifically investigate:

1. The definition and boundaries of the frugal innovation concept, and the development of a scale to measure IT-frugal innovation.
2. How firms can adopt frugal innovation practices and integrate them with existing innovation programs (process-based investigation).
3. How IT resources (e.g., technology and human), IT capabilities (e.g., project and knowledge management), and IT dynamic capabilities (e.g., agility and improvisation) enable or support frugal innovation practices.
4. Measurable cost-effectiveness and performance efficiencies resulting from frugal practices (i.e., results).

We intend to carry out research on frugal IT innovation ourselves. In order to develop a robust understanding of the practical and theoretical aspects of IT-enabled frugal innovation, we will conduct semi-structured, largely open interviews of frugal innovation practitioners in India, an emerging economy. A grounded-theory (Glaser and Strauss, 1967) approach will be employed to analyze the qualitative interview data (Matavire and Brown, 2008). Nearly 62% of IS papers that use grounded theory, use it as an analysis tool in emergent qualitative studies with some a priori theoretical foundation (Matavire and Brown, 2008), and this study is positioned similarly.

Kanter (1999) and Yin (2003) state that case studies are appropriate when researchers seek to describe phenomena, explore processes, and investigate why and how phenomena interrelate. In the second phase of our study, we plan to conduct case studies with site visits and semi-structured interviews within

practice centers or data centers of frugal innovation in India. Next, armed with a well-refined theoretical understanding of frugal practices, in phase three, we investigate innovative IT organizations in a developed economy, Canada, regarding their innovation practices to determine whether frugal principles are in use or can potentially be used to enhance innovation. Site visits and semi-structured interviews will be conducted with personnel involved in the innovation process including executives and managers at different levels within the organization.

In the second and third phases, using multiple methods and data from participants at various levels will offer data corroboration and triangulation (Yin, 2008). Pilot testing of research instruments, data analysis (including the coding of qualitative data and statistical manipulation), and the reporting of findings will also occur. The results can provide beneficial insights to Canadian businesses with respect to cost-effective IT innovation in resource-constrained environments.

Implications for theory and practice

Firstly, as noted in previous studies of frugal innovation (Bhatti, 2012; Bhatti and Ventresca, 2012), the emerging field of frugal innovation is fertile ground for development of new theory. We extend this notion to frugal IT innovation and point to a number of overlaps between frugal innovation principles and the extant literature on IT-enabled innovation. Secondly, this paper has the potential to provide new insights into the process of frugal innovation and it extends the present literature by incorporating several relevant constructs from the extant IT/IS literature. Thirdly, this paper attempts to examine the similarities and differences between several emerging innovation paradigms and investigates frugal innovation from an IT/IS perspective. This is a significant contribution. Furthermore, this paper shows how research on frugal innovation is linked with mainstream research, providing additional support for the former. Finally, the paper also provides various IT/IS perspectives for studying frugal innovation in the future.

For practitioners, this paper provides insights regarding the deployment and usage of IT systems for innovating in resource constrained settings and maintaining high operational efficiency. Similarly, IT-enabled small and medium sized enterprises can learn about frugal innovation and incorporate social and technological innovation practices into their existing innovation programs, thereby enhancing their innovation profiles. Within the current economic environment, the businesses in developed economies (especially startups) can learn from businesses in the developing economies in order to provide affordable, scalable, and socially viable products and services, while being highly innovative and profitable. Furthermore, multinational corporations can develop market-specific innovation strategies based on insights on frugal IT capabilities, and benefit multiple markets, thus making their innovation programs more effective and lucrative.

Limitations

Firstly, the concept of frugal innovation is emergent and has perhaps limited application. This makes it difficult to generalize this paper's discussion on frugal innovation. Secondly, this paper is of an exploratory nature. This is in part a consequence of the emergent nature of the topic itself. Thirdly, not everything about frugal innovation that has been published is positive. There are criticisms of frugal innovation especially in terms of initial quality issues in products and services developed using frugal innovation practices. This can cause problems in highly regulated industries such as pharmaceuticals, defence, and biotechnology. Finally, the implementation of frugal IT innovation is subjective and difficult as firms are required to internalize processes and change from well-established agile and lean processes to frugal principles. As a result, this process may be contingent on a number of factors such as the maturity of the firm, its market position, its industry and its strategic outlook. In future studies, these factors can serve as control variables.

Conclusion

Frugal innovation principles when combined with IT and viewed from the lens of IT capability, RBV, and other related literature can provide a rich foundation for frugal IT innovation research. In this exploratory paper, we explain the concept of frugal innovation and its position within a number of existing innovation paradigms. This is a significant contribution considering there is a growing body of literature on emerging

innovation concepts. We also demonstrate potential integration of frugal innovation principles with traditional IT-enabled innovation approaches – a concept we call “frugal IT innovation”. We provide mappings of each principle component of frugal innovation with IT-based constructs and point to sources in the extant literature. Furthermore, we explore potential frugal IT capabilities that may enable or drive frugal IT innovation. Finally, we provide propositions to guide future research.

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