From Frugal To Reverse Innovation: Is The Great Leap Possible? An Analysis of Diffusion Patterns of Frugal Innovations

Fouzia Ashfaq[1], Sehrish Ilyas[2] and Anum Shahid[3]

Abstract

The recent financial crises, the emergence of Base of the Pyramid markets and the growing importance of the developing economies has brought the no-frills structure of frugal innovations into the limelight. The purpose of this study is to explore this topic and answer the question: Is the great leap from frugal to reverse innovation possible? The study also sheds light on the diffusion patterns of frugal innovations. Employing a multiple case study design, a total of 25 cases of frugal products and services were investigated and their diffusion patterns were analysed under the already existing classifications of local, proximity, distant and reverse innovation. Findings show that the leap from frugal to reverse innovation requires extra challenges to be encountered. Western MNCs, in comparison with local companies, are relatively successful in extending their innovations into reverse and distant diffusions. The research has revealed that there exists need of alliances and collaborations between local players and Western MNCs to make the great leap from fugal to reverse innovation possible. Moreover, for deeper understanding, researchers may employ a higher number of cases to further refine knowledge on the topic.

Keywords: Frugal Innovation, Reverse Innovation, Diffusion Patterns of Innovation, Innovation Management, Emerging Market.

1. Introduction

New precedence is evolving from the resource-constrained environments of emerging markets such as India, China and Brazil (Agnihotri, 2015). The economic rise in these countries has created a new market segment referred to as middle market (Govindarajan, 2012), the low-income market (Sanchez & Richart, 2010) and sometimes the good enough market (Zeschky, Winterhalter, & Gassmann, 2014). The intense competition among firms, to capture the middle-class consumers of these emerging markets, has made this market segment 'next global battleground' (Zeschky et al., 2014; Gadiesh, Leung, & Vestring, 2007). Despite the high increase in income, the middle class consumers of emerging and developing countries still have lesser purchasing power as compared to Western consumers. Indeed they look for solutions that are characterized by high value and low costs (Zeschky et al., 2014). Frugal innovation is one of the solutions. The academic research on frugal innovation is in its early stage and so are the definitions which are in flux (Hossain, Simula, & Halme, 2016). Although, It is not clear that when and who used the term 'frugal innovation' for the first time, yet it got into limelight in the first half of the year 2010, just after the publication of an article by 'The Economist' titled 'First break all the rules: The charms of frugal innovation'. In this article Wooldridge (2010) states that frugal innovation is…

'not just a matter of exploiting cheap labour (though cheap labour helps), it is a matter of redesigning products and processes to cut out unnecessary costs' (p.11).

In literal sense, Oxford Dictionaries (2017) defines frugal as 'simple and plain and costing little'. It reflects 'economy in the use of resources' (Merriam Webster, 2017). Whereas transfer of these resource-constrained solutions to developed economies is reverse innovation (Hossain et al., 2016).

Affordability is the most important underlying factor that affects purchasing decisions in the context of low –income markets (Prahlad, 2010). In these markets of cost-sensitive customers, Western multinational corporations (MNCs) see a great growth opportunity (Radjou, 2014 ; Zeschky, Widenmayer, & Gassmann , 2011). The aggressive competition between firms originating from emerging markets / developing countries and Western multinational corporations (MNCs) is getting intense as local companies are increasingly offering superior value at lower cost in both products and services (Zeschky et al., 2011).

[1]Assistant Professor, Lahore Collage for Women University, Lahore. fouziams@hotmail.com
[2] Assistant Professor, Lahore Collage for Women University, Lahore. sehrishb35@yahoo.com
[3]Lecturer, Lahore Collage for Women University, Lahore. anumshahid2007@gmail.com

Roland Berger Strategy Consultants (2013) estimate that within the next five years share of the frugal products and services, in the global market, is to get double. Rosca, Arnold, & Bendul (2017) also support this estimate and states that frugal and reverse innovations and related concepts are of growing importance in the management research. Yet many facets of frugal innovation are still extinct in the academic literature, although it has emerged as a topical phenomenon (Hossein et al., 2016). Particularly the journey of innovation from frugal to reverse and its geographic diffusions are still uncharted topics. Cunha, Rego, Oliveira, Rosado & Habib (2014) while reviewing systematic literature, also endorsed that the research stream of frugal innovation is still in its infancy.

The purpose of this study is to explore the trends and possibilities of innovation from frugal to reverse. It also sheds light on the diffusion patterns of frugal innovation. The present research paper is structured as follows: first, the extant literature relevant to frugal innovation, their attributes of disruption, reverse innovation and diffusion patterns of frugal and reverse innovations are discussed. Second, the research design is presented and cross-case analysis is discussed. Next, findings are concluded and summarized. The paper concludes with a discussion of frugal innovation, its conversion into reverse innovation and draws suppositions for future research.

2. Literature Review

Frugal and reverse innovation is an emerging concept in the existing literature. More importantly, the literature is lacking any in-depth study that shows their diffusion patterns in different regions geographically (Hossain et al., 2016). This paper aims to provide a conceptual understanding of the terms frugal innovation and reverse innovation, along with the diffusion patterns of these innovations.

2.1 Frugal Innovation

In 'Frugal Innovation', the word frugal is used as an adjective that represents the characteristics of being 'economical in use or expenditure; prudently saving or sparing; not wasteful; entailing little expense; requiring few resources' (Tiwari, Kalogerakis, & Herstatt, 2016). It implies the careful and cautious use of organizational resources and ensuring optimum utilization of scarce resources while minimizing waste (Bedi & Vij, 2016). Gupta (2011) states that:

'Frugal Innovation is a new management philosophy, which integrates specific needs of the bottom of the pyramid markets as a starting point and works backward to develop appropriate solutions which may be significantly different from existing solutions designed to address needs of upmarket segments'(p.1).

According to Hossain et al. (2016), frugal products & services are innovated under the resource scarcity environment and their context which focus on low-income markets is entirely different from innovations in developed markets. For some researchers, frugal innovation is simply low-cost products (Ramamurti, 2012). Others call it 'toned down' and 'good enough products' (Hang, Chen, & Subramian, 2010; Zseshky et al., 2011). Zeschky et al. (2011) further define it under those strategies that include redesigning products; reconfiguring value chains (Sharma & Iyer, 2012), or transformation of the entire ecosystems (Bound & Thornton, 2012). Ernst and Young (2011) explain it as providing affordable products with economical use of resources for the lower income group. Bhatti & Ventresca (2013) sums up his views on frugal innovation as 'means and ends to do more with less for more people'.

The researchers also disagree on some fronts regarding frugality. Zeschky et al. (2014) , for example, identify frugal innovation as technologically superior, in comparison with other available alternatives in the market, stating that 'the most complex technical and organizational capabilities are required for frugal innovation', On the other hand Radjou, Prabhu & Ahuja (2012) label frugal innovation as 'an innovative fix: an improvised solution born from ingenuity and cleverness'. Radjou & Prabhu (2015) also disagree with Zechsky et al. (2014) and state frugal innovation as the ability to do more with less which significantly create more value while minimizing the use of scarce resources i.e energy, capital, and time.

For the research paper, we have opted an approach that is closer to Radjou and Prabhu, as we define frugal innovation in terms of product, process or services to cater the bottom of pyramid despite financial, technological, material or other resource constraints. The final outcome remains significantly cheaper than competitors and is good enough to fulfill basic needs of underserved customers which otherwise would not have been possible (Hossain et al., 2016). Frugal Innovation turns resource constraints

whether financial, material, or institutional, into advantages (Bound & Thornton, 2012) by introducing new product architectures that may reach an entirely new customer group (Zeschky et al., 2014).

2.1.1 Are Frugal Innovations Disruptive?

Christensen (2003) & Rao (2013) describe disruptive innovation as simpler, smaller, cheaper and easy to use. Figure No. 1 represents how Christensen distinguishes, features of a disruptive innovation from a frugal innovation.

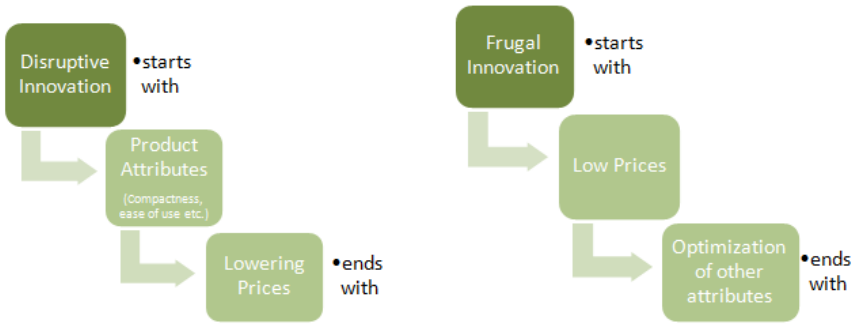


Figure No. 1: Critical Distinction between Disruptive Innovation and Frugal Innovation (Christensen 2003)

The weightage given to lower prices in frugal innovation restricts the designer from using resources in excess of the requirement (Jamall & Papageourgiou, 2017). The frugal design process is streamlined by subsequent optimization of other features such as quality resulting in a product with basic minimum components that functions sometimes at par and other times even better than the traditional existing products (Rao, 2013). Moreover, the priority of cost reduction gives frugal innovation- a head start for the evolution of a product that is good in functionality and lean in nature, whereas, the existing traditional products may never mature into a leaner version (Rao, 2013; Jamall & Papageourgiou, 2017).

2.2 Reverse Innovation

Reverse innovation' got a dramatic prominence following the publication of an article: 'How GE is disrupting itself' by the CEO of General Electric Jeffrey Immelt along with his associates Govindarajan and Trimble in 2009. According to them low-cost innovations that are first accepted in emerging economies and later 'trickle up' to the developed economies are called 'Reverse Innovations' (Hossain et al., 2016; Immelt, Govindarajan & Trimble, 2009; Trimble, 2012; Zedtwitz, Corsi, Søberg, & Frega, 2015). Their concepts revolve around market rather than a product (Zeschky et al., 2014). Borini, Costa & Oliveira Junior (2016) state that first successful innovations are being created in the developing countries by Western MNCs and with new ways of competitive edge, then these are exported to Western countries. This diffusion of reverse innovation is used as a tool by the Western MNCs, to boost their competitive position (Edwards & Tempel, 2010; Radjou, 2014). Hossain et al. (2016) define the scope of reverse innovation as follows:

'A resource-constrained solution (i.e., product, service, process, or business model) that has been introduced first, either successfully or not, in emerging markets or developing countries and then successfully transferred (with some modifications)to developed countries' (p.2).

In general, the number of cases and examples regarding reverse innovation in the existing literature are limited (Govindarajan & Ramamurti, 2011; Rosca et al. (2017) although few examples have been discussed that cover the area (Talaga, 2010 & Hart, 2010). According to Govindarajan (2012), the concept of reverse innovation is feasible but it requires organizations to discard their previous structure, re-orient their production methods, adopt new innovative techniques with a fresh setting for sales force; hence making only a few of the firms succeed in the endeavour. Govindarajan and Trimble (2012), further argues that challenge for companies is not only to get good in innovating in emerging economies, rather learning how to bring back these innovations back to their core markets. According to them, it is an imperative, not an option. Some of the multinationals like General Electronics (GE) uses this approach and initially target low-income consumers in emerging markets for frugal innovations, thereafter; they turn their frugal

innovations into reverse innovations by bringing them back to the developed countries (Hossain et al., 2016).

2.3 The Diffusion of Frugal Innovation

Diffusion is a process in which an innovation spreads in a market over time, after serving a social system through certain channels (Rogers, 2010). Scholars are of the view that all frugal innovations do not become reverse innovations, however, all reverse innovations are also frugal (Hossain et al., 2016; Rosca et al., 2017). With limited research, the diffusion patterns of frugal innovation are still a blind spot in the academic literature. However, the emerging trends call for its detailed analysis and discussion. Westerns companies would be at risk of losing market share if they continue to ignore the growing middle class in developing /emerging markets (Zeschky et al., 2014). Frugal Innovation has different customers (Hossain et al., 2016). Sinkovics, Sinkovics & Yamin (2014) state that developing countries have their own constraints of capital, technology and talent, so their innovations are normally meant to solve their local problems. Tiwari and Herstatt (2012a) state that as frugal has price-sensitive customers, thus, affordability is the main concern. Hossain et al. (2016) put it in this way that, customers opting frugal innovations look for both affordability and value. They further state that the patterns of frugal innovation are evolving as the consumers in the developed markets are also becoming price sensitive; however, the spread of innovation in different countries is mostly with similar socioeconomic conditions.

For further analysis of diffusion patterns, we have categorised frugal products and services in four patterns outlined by Hossain et al. (2016). According to his framework following diffusion patterns exists for frugal innovations:

- 'Local Diffusion' realizes only a fraction of its potential. Its diffusion is limited and does not spread even nationally.
- Diffusion to similar socio- economic conditions is termed as 'Proximity Diffusion' of frugal innovation. Mostly it diffuses to some neighbouring countries that have the similarity with home country's socio-economic conditions.
- Spread of innovation not only to nearby countries but also into other countries but not developed countries is 'Distant Diffusion' of frugal innovation.
- Diffusion of innovation including developed economies is termed as 'Reverse Diffusion' of frugal innovation which may also be termed as reverse innovation.

3. Research Design

3.1 Research Strategy

An exploratory multiple case study approach is used to analyse the 25 cases of frugal products and services. According to Rosca et al. (2017) when the research is in its infancy, it is best to use an exploratory approach as no explicit testable hypothesis exist. As earlier discussed, frugal and reverse innovation's streams of literature have not reached a maturity stage yet and thus, exploratory nature of the investigation is a suitable approach (Rosca et al., 2017).

3.2 Data Collection

Academic articles in journals and books, interviews with executives, company websites and university reports are used for data collection and analysis. Pitta, Guesalaga & Marshall (2008); Rao (2013); Zeschky et al. (2014); Hossain et al. (2016) and Rosca et al. (2017) all presented a good overview of frugal products and services. Only those frugal products and services are selected, which have been identified as 'frugal' by at least two academic sources and have been successful, to a certain extent, in achieving their strategic goals in terms of development objectives, sales and profitability. To account for, the factors of heterogeneity and to assess the best practices across different contextual aspects, the sample entails a cross-country and cross-industry design (Yin, 2013). Examples of frugal innovations range from product innovations (i.e medical equipment, cars, home appliances etc.) to service innovations (i.e surgery, consultancy, transport services etc.) They cover different industries (i.e health, telecommunications, education etc.) as well as diverse geographical areas (i.e Asia and Africa etc.) These small and large case examples of different companies from different sectors provide a base to understand the diffusion patterns of frugal innovations.

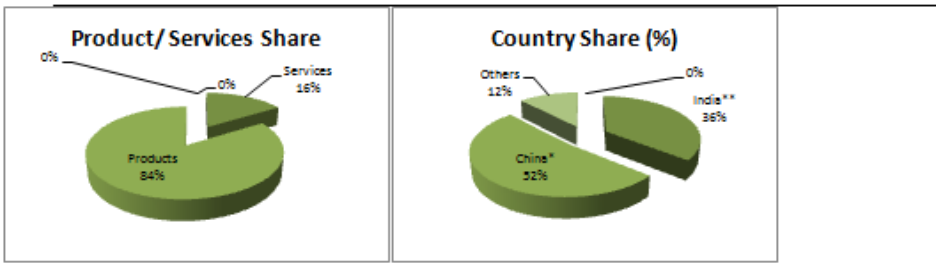
Table No.1: Frugal Innovations with Diffusion Patterns

S.NO	Company	Country*	Name and Type of the Product	Diffusion
1	General Electronics	India	Mac 400 & 800 Handheld electrocardiogram (ECG); Sophisticated technology with compact design, ease of use and lower costs (Rao, 2013).	Reverse Innovation From developing to developed (Rosca et al., 2017)
2	General Electronics	China	Vscan: Low-cost scanner; a handheld, cellphone-sized ultrasound machine (Weyrauch & Herstatt, 2016) quick diagnosis and highly useful for clinics in smaller cities (Winterhalter, Zeschky & Gassmann, 2016)	Reverse Innovation From developing to developed (Rosca et al., 2017; Weyrauch, & Herstatt, 2016)
3	General Electronics	China	Logic Book: Portable / laptop sized ultrasound; with the same power as any full-size scanner. For remote rural areas (Winterhalter et al., 2016);80% cost reduction (Immelt et al., 2009)	Reverse Diffusion From developing to developed (Hossain et al., 2016; Rosca et al., 2017)
4	Columbia University, USA	Ghana	Bamboo Bike; Simple technology, environment-friendly, robust design with lower cost (Rao, 2013).	Reverse Innovation From developing to developed (Rosca et al., 2017)
5	Nokia	Finland	Nokia 1100: Mobile handset; Robustly built, pared down to the basic features that low-income consumers could pay for, and included a much-valued component: a flashlight. (Simula, Hossain & Halme, 2015), Agnihotri, 2015; Heeks, 2012).	Distant Diffusion. Diffusion from middle to lower sector of society (Agnihotri, 2015) World's best-selling phone (Heeks, 2012) targeted at developing countries.
6	General Electric	India	Lullaby: Baby Warmer; Direct heat in an open cradle and is used to help new-born babies adjust to room temperature while monitoring their pulse and weight (Fleck, 2013).Global safety standards coting 70% below traditional baby warmers (Agnihotri, 2014).	Distant Diffusion Selling to countries including Indonesia Belgium, Brazil, Dubai, Egypt, Italy, the Russian Federation and Switzerland (Fleck, 2013).
7	TATA Consultancy Services (TCS)	India	IT Consulting Firm; An information and communication platform (Rao, 2013) provides IT offshore outsourcing with development of a system of managing knowledge and expertise to compete and deliver on client's expectations (Oshri, Kotlarsky, & Willcocks , 2007)	Reverse Diffusion Hossain et al. (2016) From developing to developed (Rosca et al., 2017)
8	Godrej and Boyce	India	Chotukool: Refrigerator; Works without compressor but has cooling capacity for water and vegetables etc for 7-8 hours without electricity (Agnihotri, 2015)	Local Diffusion Hossain et al. (2016)
9	Safaricom	Kenya	M-Pesa: Mobile Banking; Transfer of funds through SMS for people who had no access to banking (Graham, 2010 & Zeschky et al., 2014)	Reverse Diffusion From Kenya to UK, Barclays Bank (Govindrajan, 2012).
10	Tata Motors	India	Tata Nano: Car; Launched as an ultra-low priced, safe, affordable and all-weather form of family transport (Simula et al., 2015)	Proximity Diffusion, From India to neighbouring countries Hossain et al., (2016).
11	Vortex Engineering Pvt Ltd.	India	Vortex Gramateller: Solar Powered ATM; Designed to suit rural and semi-urban conditions e.g. unreliable power supply and higher illiteracy levels of end users with inbuilt fingerprint identification system (Tiwari & Herstatt, 2012b).	Distant Diffusion From India to its neighbours as well as distant countries e.g Madagascar & Djibouti Hossain et al. (2016)
12	Narayana Hrudayalay Hospital	India	Open Heart Surgery; It is a pioneer in low-cost cardiac care and has sought new innovative ways to perform open heart surgeries for $2,434— with world class quality (Manohar & Pandit, 2014).	Local Diffusion At present in Bangalore. From India to Cayman Islands within next 10 years (Shah et al., 2014; Govindrajan, 2012)
13	Qiagen	China	Care HPV; World's first molecular diagnostic designed to detect for High-risk human papillomavirus (HPV) in rural environment with robustness for rough use conditions (Zeschky et al., 2014).	Distant Diffusion; Launched in India on Feb 26, 2014 (Qiagen, 2014). Recently to Central America and Africa (Qiagen, 2017)
14	Siemens	China	Computed tomography scanner; Fast workflow, designed, for intensive use high reliability with ease of use (Zeschky et al., 2011)	Reverse Innovation From developing to developed (Rosca et al., 2017)

15	Saurer Volkmann	China	Focus: Twisting Machines; Offered reduced but tailored features and options as well as low energy consumption (Zeschky et al., 2014 ; Winterhalter et al., 2016)	Reverse Innovation From developing to developed (Rosca et al., 2017)
16	Seimens	China	HMI Panel: Human Machine Interface; All in one Panel PC devices, integrate an industrial PC and an operating unit, and then offer a combination of ruggedness, performance and brilliant display (Agarwal & Brem, 2012).	Reverse Innovation From developing to developed (Rosca et al., 2017)
17	Mettler Toledo	China	Weighting Scale; Functionality limited with sufficient accuracy and high-reliability Zeschky et al. (2011)	Reverse Innovation From developing to developed (Rosca et al., 2017 & Zeschky et al. 2014)
18	Logitech	China	M215: Wireless Computer Mouse; Ease of use with simple functions, basic packaging, established Technologies(i.e USB dongle, wireless connection etc.) Zeschky et al. (2011)	Reverse Innovation (Zeschky et al. 2014; Ostraszewska & Tylec, 2015). Worldwide Diffusion (Trimble 2012; Govindarajan & Trimble 2012)
19	ZPMS	China	Harbor crane manufacturer; Cost innovation capabilities in bridge construction (Zeschky et al., 2014)	Reverse Innovation (Zeschky et al., 2014 & Barboza, 2011)
20	Galanz	China	Microwave oven; Low cost, energy efficient can be used for steam cooking, deep/stir frying, serving as a sterilization cabinet (Hang et al., 2010).	Reverse Innovation (Hang et al., 2010)
21	Haier	China	XQBM: Washing machine; Small highly-efficient, offering 12 different wash modes; based on 'Mini Magical Child'- Haier's earlier successful version of a mini washing machine (Hang et al., 2010).	Reverse Innovation (Hang et al., 2010)
22	Yadea	China	e-bikes; affordable and well designed, environmental-friendly bikes offering a 'green' alternative to fill the gap between gasoline motorbikes and bicycles (Hang et al., 2010)	Reverse Innovation (Hang et al., 2010)
23	Suzlon	India	Wind turbines generators; Wide range of environmentally friendly products that include wind turbine generators in capacity from 350 kW to 2.1 MW with customized versions suitable for different climates (Hang et al., 2010)	Reverse Innovation (Hang et al., 2010)
24	Philips	China	Bedside patient monitoring system; With simple functions, high reliability and ease of use, robust design (Zeschky et al., 2011)	Distant Diffusion Initial target market emerging markets (Zeschky et al., 2011)
25	Tata Chemicals	India	Tata Swach : Water purification system; World's cheapest household filter, targeted in areas with poor access to electricity or running water (rural or semi-urban) Tiwari & Herstatt, (2012b)	Local Diffusion Indian states; soon to other developing countries (Lavallee & Veach, 2010; Maiti 2012; Tiwari & Herstatt, 2012)

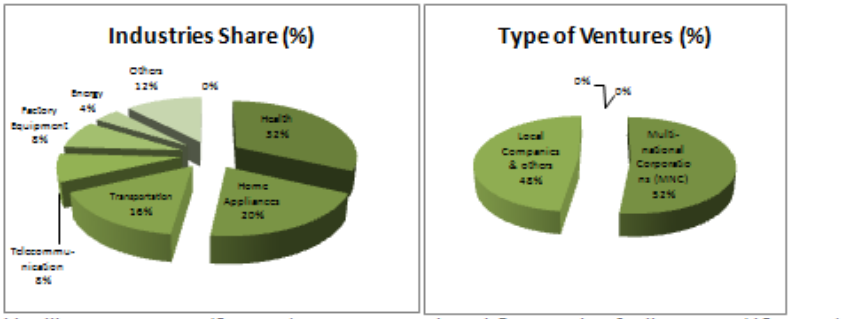
*Country/ R&D subsidiary of the Western MNCs

Figure 2 provides an overview of the proportion of product and services, geographical coverage, share of industries and types of ventures initiated by MNCs and local companies.



Products (21 cases)
Services (4 cases)

China (13 cases)
India (9 cases)

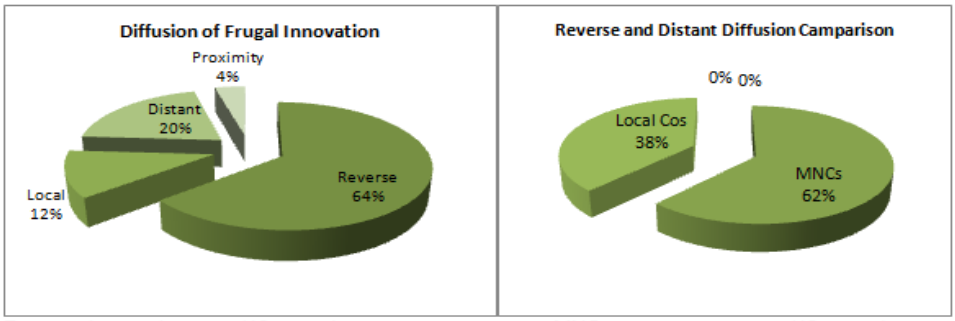


Health	(8 cases)
Home Appliances	(5 cases)
Transportation	(4 cases)
Telecommunication	(2 cases)
Factory Equipment	(2 cases)
Energy	(1 case)
Others	(3 cases)

Local Companies & others	(12 cases)
Multi-national Corp. (MNC)	(13 cases)

Figure No. 2: Overview of selected cases for the analysis

Figure 3 displays the diffusion extent of frugal innovation along with comparison between MNCs and local companies in diffusing frugal into reverse and distant innovation.



Reverse Innovation	(16 cases)
Distant Innovation	(5 cases)
Proximity Innovation	(1 cases)
Local Innovation	(3 cases)

MNCs	(13 cases)
Local Companies	(8 cases)

Figure No. 3: Diffusion Patterns of Frugal Innovation

4. Cross Case Analysis and Discussion

Our objective is to provide an insight into the possibilities of innovation from frugal to reverse with a focus on diffusion patterns of frugal innovation.

Out of 25 cases, 3 cases show attributes of local diffusion. For example, Chotukool refrigerator, Tata Swach and Narayana Hrudayalay Hospital come in this category. Chotukool was not able to diffuse to every state in India (Hossain et al., 2016). Same is the case with Tata Swach. Although Narayana Hrudayalay Hospital at present is localized in Bangalore however it will convert into Distant Diffusion within next 10 years (Shah et al., 2014).

1 case shows the characteristics of Proximity Diffusion i.e Tata Nano which has diffused to some neighbouring countries that have the similarity with home country's socio-economic conditions. 5 cases shows spread of innovation not only to nearby countries but also into other countries but not developed countries. For example Vortex Gramateller of India has also spread to other continents such as Africa. Other examples include Nokia 1100, GEs Lullaby baby warmer, Qiagen's Care HPV and Philips bed side monitoring system.

16 cases may be termed as reverse innovation. For example, GE's scanners and electrocardiogram, Siemens' tomography scanner and HMI Panel, Galanz's microwave, Haier's washing machine, Ghana's bamboo bike, Saurer Volkmann's twisting machines and Mettler Toledo's weighing scale are all case examples of reverse diffusion of frugal innovation.

According to Hossein et al. (2016), there exist six paths or directions that may be taken up by frugal innovation. Our study, however, identified eight paths--- further segregating the diffusion patterns initiated by local companies Vs Western MNCs.

The likely paths are:
Path 1: Local Diffusion may reach out to Proximity Diffusion
Path 2: By reaching to remote countries having similar socio-economic settings, Proximity Diffusion turns into Distant Diffusion.
Path 3: Occasionally, Distance Diffusion may travel further into developed countries and becomes Reverse Innovation
Path 6: In some rare cases, after getting the proximity diffusion phase, an innovation may directly become reverse innovation.
Path 7: In some rare cases, particularly if initiated by Western MNCs, Local Innovation may turn into Distant Diffusion directly.
Path 8: Occasionally, innovation particularly by Western MNCs, can also covert a Local Innovation directly into Reverse Innovation.
The two unlikely diffusion patterns, particularly when initiated by local companies remain as:
Path 4: A frugal innovation from Local Diffusion to becoming a Distant Diffusion by bypassing the neighbouring countries (Proximity Diffusion).
Path 5: In an extremely rare case, a frugal innovation converting directly from Local Diffusion to Reverse Diffusion not passing the Distant Diffusion or Proximity Diffusion paths.

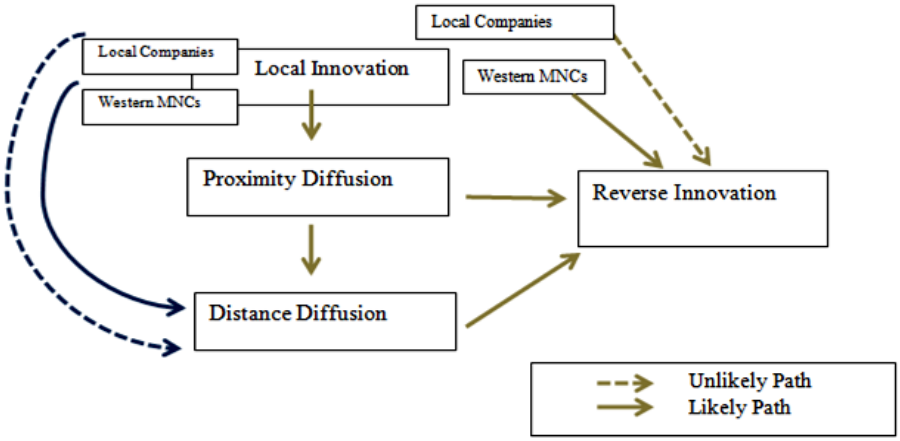


Figure 4: Diffusion Patterns of Frugal Innovation
Model Adaption; Hossain et al,(2016)

The analysis of 25 cases reveals that functional qualities, technology and adherence to global standards of an innovation play a significant role in diffusion. Most often, local, less costly and simple products are considered for local frugal innovation. Whereas, using state of the art technologies and high-

end materials may be a condition for reverse innovation. GE, Siemens and Vortex manifest these characteristics whereas Tata Nano initially compromised on safety and Chotokool represent lower-end technology. Therefore, despite the existing unmet needs of cold storages and mobility from one place to another, both Chotokool and Tata Nano was unable to diffuse very widely (Hossain et al., 2016).

The cases of GE, Siemens, Haier and Mettler Toledo reveal that Western MNCs are good at reverse diffusion of frugal innovation, from developing countries to developed countries as they already have a presence in the developed markets. Otherwise, it may take many years for a frugal innovation to become a part of mainstream innovation in the developed countries. The analysis also reveals that this is not the only factor as start-up firm like Vortex Engineering was able to diffuse their innovation to distant countries and Galanz was even able to reach to the next level of reverse innovation by entering in the developed markets. Thus, if a frugal innovation attracts cost-conscious users or has convenience and value for consumers in the developed markets, it can capture share (Hossain et al., 2016). Yang, Su & Fam (2012) concludes in their research that there exist challenges and pressures of working in an entirely different institutional environment. Hence to commercialize an idea that originated in a very different market requires extra challenges.

The cross-case analysis also reveals that although India and China both represent themselves in frugal innovation market, however, China is ahead in conversion of frugal into reverse innovation. The common assumption that large firms while possessing natural resources can enter new markets faster (Prahalad, 2010; London, 2004; Hossain et al., 2016) imply in these cases also. Furthermore, our analysis reveals that those frugal innovations which constitute a platform to serve many customers have a better chance of faster diffusion rather than those frugal innovations which are sold to consumers as physical products (Hossain et al., 2016). In comparison with local players, Western MNCs develop frugal innovation according to global standards (GE products). These may be expensive in developing countries but have acceptability in developed countries being cheaper while providing value (Hossain et al., 2016). Customers will only buy the cheaper product if it serves the purpose.

5. Conclusion and Implications

The landscape of global innovation is changing. Our prevailing assumptions of ‘doing business’ have been questioned due to recessions faced by the developed world and the parallel growth in emerging markets. A new wave of ‘rethinking business’ is on the way in the form of ‘frugal innovation’ i.e doing more with less. However so much is still to accomplish. Frugal innovation is not only the answer for the resource constrained economies of developing world but also for the stagnating developed economies with increasing pressures for more efficient utilization of resources. Frugal innovations increase competition and reduce prices by engaging a completely new group of customers, also contributing towards sustainable development in many ways (Levänen et al., 2016). Moreover, they transfer a portion of their research & development setting to developing countries (Hossain et al., 2016). On the other hand, reverse innovations, despite still being few in number provide new opportunities to firms that originate from low income (bottom of the pyramid) markets to enter the developed market. This distinct feature of frugal innovation stimulates new patterns of diffusion, and hence warrants the attention of academia and practitioners.

In concluding, the following findings can be highlighted:

- The leap from frugal to reverse innovation requires extra challenges to be encountered.
- A leader in frugal innovation may not be a leader in reverse innovation as both have different attributes.
- Frugal innovations that are launched by MNCs are relatively more successful in becoming a reverse innovation.

For future research, the topic contains a number of opportunities to explore. Future research may discuss the possibilities of alliances and collaborations between local players and Western MNCs to make the great leap from fugal to reverse innovation possible. Moreover, to have compelling insight and deeper understanding, researchers may employ a higher number of cases or a single in-depth case study method to further refine knowledge on the topic.

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