The Art of Enabling Reverse Innovation – a Complexity-Based Approach

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Introduction

> *"If you hear advice from a grandmother or elders, odds are that it works 90 percent of the time. On the other hand, in part because of scientism and academic prostitution, in part because the world is hard, if you read anything by psychologists and behavioral scientists, odds are that works at less than 10 percent."*
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> **Nassim Nicholas Taleb** in *Skin in the Game*.

This chapter is neither praise for grandmothers nor an argument against science and academic institutions. This chapter is about reverse innovation. Reverse innovation is an innovation for the poor that potentially transforms the lives of the people in rich countries (Govindarajan & Trimble 2015). Innovation is called 'reverse' as it challenges many assumptions about how innovations originate and diffuse. A car that costs only 2000 USD or a portable electrocardiogram (ECG) for less than 1000 dollars are tempting value propositions, which will also be noticed in economically developed countries. Grandmothers can play important roles in reverse innovation as they can help to understand the lived experiences in the particular context. On the other hand, academic research is needed and/or requires for the generalization of the particularities with concerns or observations.

This chapter explores the enabling conditions for reverse innovation. The chapter builds on the conviction that the black box of reverse innovation cannot be opened with the concepts developed mainly for the world of scientific and technological innovations. Therefore, in order to shed light on the black box, this chapter leans on complexity thinking and particularly on its metaphorical and critical pluralist schools (Richardson 2008). Adapting Rogers's (2003) division of innovation process into two phases, ex ante and ex post of the innovation decision, this chapter focuses on understanding ex ante conditions, not explaining how reverse innovation can end up on the shelves of multinational companies' stores in developed countries.

Reverse innovation – a new paradigm or old wine in a new bottle?

A paradigm refers to a set of assumptions about the nature of reality. Consequently, a paradigm shift means "a change in the basic assumptions…within the ruling theory of science" (Kuhn 1962).

Innovation paradigm consists of several assumptions, such as that innovation can manifest itself in a new or improved product, service, process or system. Similarly, innovation is about incremental, radical or disruptive change, innovation outcome is uncertain and risk, the novelty of innovation is context-specific. On the other hand, innovation adoption and diffusion are complex processes and innovation embraces diversity and creativity. A history of innovation tells a story where scientists make breakthroughs by continuously and rigorously exploring the unknown. Though serendipity (i.e. the accidental discovery of something valuable) occasionally plays an important role, the innovation process itself has been seen as consisting of sequential activities such as knowledge gathering, persuasion of key stakeholders, making 'go' or 'no-go' decision and in case of a 'go' decision, the implementation of innovation (Rogers 2003). The project IRIS planned for go decisions which included all the aspects of this assumption.

The dominant view in the literature has been that innovation is something that arises from advances in science and technology. Developing countries have been more or less on the sidelines. This is understandable, as high-end innovations require consumers who have purchasing power. Things are, however, changing. There have always been "stripped-down" innovations, which are "good enough" and affordable for consumers with low income. During the last 15 years, innovation researchers have witnessed a development where multinational corporations (MNCs) from medical equipment industry to telecommunications and from food industry to infotainment have invested in innovation actions in low-income countries.

The development called for new concepts and theoretical frames. Reverse innovation coined by Vijay Govindarajan (also known as 'cost', 'good-enough' and 'frugal' innovation, see more Zeshky et al. 2014) refers to those innovations which are first adopted by developing countries and low-income markets before they diffuse to developed and wealthy countries (Govindarajan & Trimble 2015). Like all innovations, reverse innovation means unleashing creativity for seeking novelty and changes in an uncertain and complex process. For example, concepts of open innovation (Chesbrough et al. 2006), user innovation (von Hippel 2005) and social innovation (Mulgan et al. 2007) share many similarities with reverse innovation. They all pay attention to everyday needs, roles of end users and the interactions between 'innovators' and their environment.

However, as reverse innovation first takes place in the developing world and is then adopted by the developed world, it fundamentally challenges many assumptions related to science-intensive and technology-oriented innovations. It does so, because it praises the 'less is more' thinking. Reverse innovation suggests a turn in the flow of innovation from 'west-to-east' to 'east-to-west' (Govindarajan & Ramamurti 2011). Govindarajan describes the counterintuitive nature of reverse innovation as follows: "… sometimes it's easy to see why a poor man would want a rich man's products, but it is not easy to see why a rich man would want a poor man's product" (Govindarajan & Euchner 2012: 13).The problem arises when the creators' mindsets contradict with the unique economic, social and technological contexts of adoption and diffusion of reverse innovation (Winter & Govindarajan 2015). Reverse innovation poses new dilemmas which cannot be solved without a mindset change. Zeschky

et al. (2014: 271), have suggested that in order to succeed in reverse innovation, "Western MNCs may need to reconsider the subsidiary's role of a local adaptor and transform it into a value-creating innovation" and even into "a new type of centre of excellence, i.e., one that focuses and specializes on the development of frugal – as opposed to advanced – product innovations". Reverse innovation means that "the innovation loci and foci are changing and there is a need to update innovation management theories, models and frameworks" (Simula et al. 2015: 1567).While intuitively thinking the 'less is more' approach sounds easy to implement, however, it might be as Taleb (2018: 25) suggests "it is harder for us to reverse-engineer than engineer".

Complexity thinking in innovation literature

Complexity thinking refers herein to a multidisciplinary approach in which comprehensive, holistic thinking replaces a worldview where simplifying causal relations and reductionism as well as a linear reasoning, control over matters and predictability are emphasized (cf. Mitleton-Kelly 2003, Krakauer 2019). Complexity thinking assumes that events and phenomena are interwoven in way that they cannot be separated. While the whole is constructed of parts, the whole cannot be reduced to its parts. This also means that complexity qualitatively differs from complicated. Cilliers (1998), for example, explains the difference as follows "a jumbo jet is complicated, but a mayonnaise is complex". A jumbo jet can be manufactured with detailed instructions and mayonnaise can be made with a good recipe, but only the jumbo jet can be taken to pieces and built again. Making mayonnaise is an irreversible process: when soybean oil, whole eggs, vinegar, water, salt, mustard, sugar and other ingredients have once been blended, they cannot be separated in any meaningful way. Similarly, innovation is a blended process whose result emerges through interaction within and between ideas, people and circumstances. The ownership of ideas can be traced, but even the best idea will fail if not supported by the people.

Complexity thinking has been used in different ways and for various purposes in innovation research. It has increased understanding, for example, on innovation processes, adoption and diffusion of innovation, innovation management and leadership and innovation policy. Frenken (2007) explored technological innovation and found out that complexity theory provides a useful approach for analyzing complex interaction structures between components of technologies as well as between agents engaged in collective invention. Chae (2012) developed an evolutionary framework for service innovation. Complexity theory allowed him new possibilities for capturing multidimensionality of service innovation and exploring service innovation strategies. Matei & Antonie (2015) used complexity theory for studying complexity-based insights on social innovation. They speak in favour of decentralization and self-organization and emphasized the need for building adaptive capacity. Chica et al. (2013) argued against thinking that links organizational learning, innovation and internationalization through causal linearity. Instead, they propose a dynamic theoretical model that has mutual causality at its core. Based on ideas originating in complexity theory, they suggested two different complex systems models. One is characterized by adaptive learning, incremental innovation and low internationalization, whereas the other is characterized by generative learning, radical innovation and global internationalization. Carlisle & McMillan (2006) described how innovation ability is, both in short and long terms, a key property of complex adaptive systems who try to navigate in an uncertain environment and make use of "the edge of chaos". Mendes et al. (2016) offered the complexity leadership theory, in which they argue and explain how learning and innovation emerge and affect organizational performance. Hall & Clark (2010) used the complex adaptive systems approach for describing opportunities and challenges of innovation policy. They suggest that adaptation capacity should be recognized as a key developmental priority when linking together new configurations of actors and resources to innovate solutions in ever-changing contexts. Bressers & Gerrits (2015) relied on complexity thinking in evaluating national knowledge and innovation programmes. They proposed a framework for evaluation that takes systemic complexity into account and helps to avoid the temptation of trying to reduce and simplify complexity.

A brief review of research literature shows that complexity thinking offers opportunities to explore, describe, analyze and to some extent

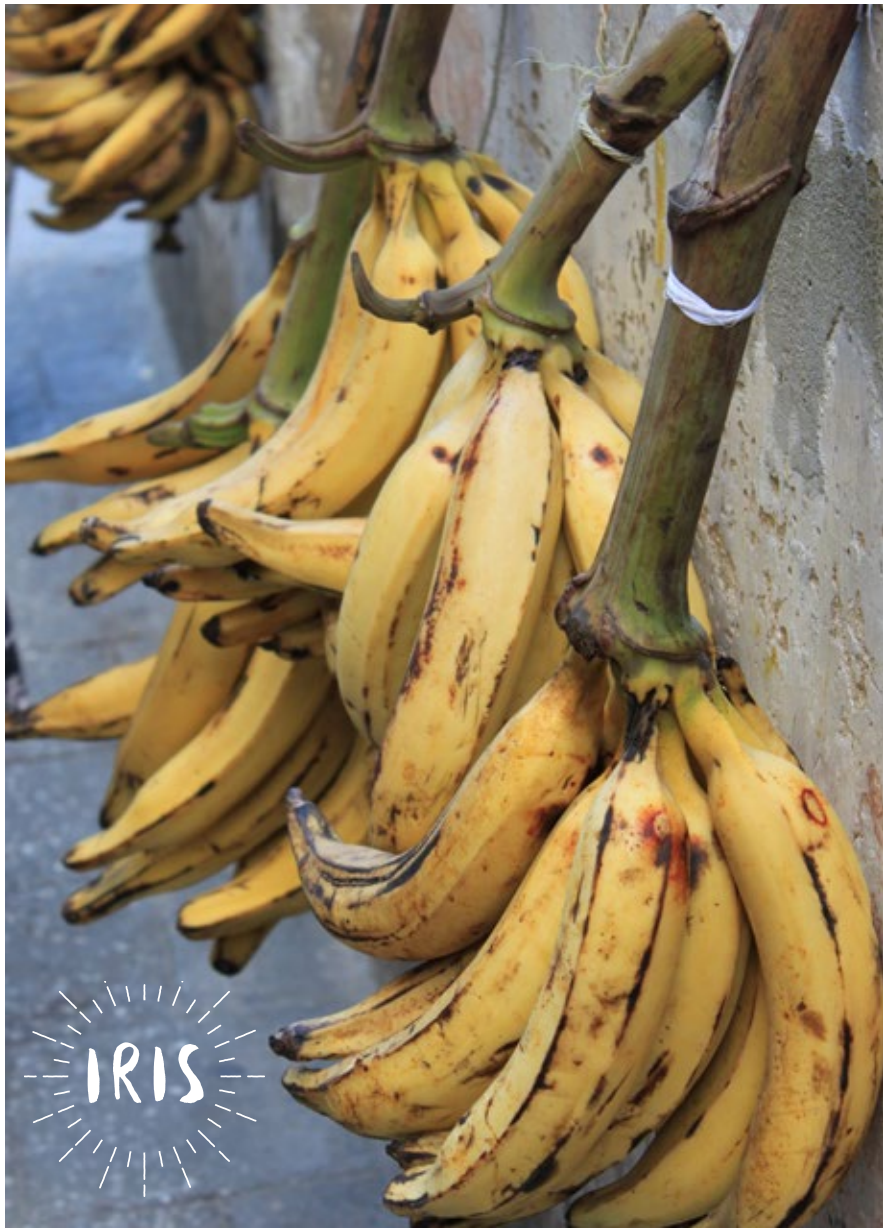
also explain innovation in many levels and different contexts. The next section will turn to show how some key complexity concepts can be used in the context of reverse innovation.

Reverse innovation through complexity lenses

Complexity thinking emphasizes interactions that produce unpredictable behaviour which, however, is constrained by order-generating rules. The power of complexity thinking arises from its ability to provide a coherent approach to regularities of irregularities of the behaviour of complex systems – i.e. systems (e.g. organization, team, groups) whose properties or characteristics result from the interactions within the system and between the system and its environment. It is believed that complexity thinking resonates with the fundamentals of reverse innovation as they both resist the management approach based on linear logic and causal reasoning. They both also resist the notion of determinism – the idea that any initial condition has only one, inevitable outcome. There are so many and interlinked causes behind reverse innovations that the outcome is practically unpredictable (cf. McCrystal et al. 2015).

Enable self-organization

Self-organization refers to a spontaneous and endogenous process of organizing through increasing and decreasing information (Mitleton-Kelly 2003). It occurs when a complex system exchanges information, operates and is constantly shaped by the actions of other entities. Self-organization can be described as a chain in which the production of information is followed by imbalance or chaos, which requires the reduction of information, which in turn implies a reorganization of the complex system. Adapting Prigogine& Nicolis (1989), it can be argued that a system's ability to generate and reduce information determines its self-organization capacity.



Self-organization is an important enabler factor for reverse innovation for two interlinked reasons: reverse innovations arise from localized interactive processes and they require the ability to manage uncertainty. The locality means know-how about the needs, expectations and constraints of potential innovation adopters. Zeschky et al. (2014), for example, studied the organization of reverse innovation in MNCs and found out that in order to succeed, the design and development of reverse innovation should be located in the MNC's subsidiary based in a resource-constrained environment. Local people know local challenges and opportunities. People grown up and trained in developed countries do not know what it means to live in a resource-constrained and therefore they are not able to understand the local needs. To absorb local requirements and to adapt local constraints, Govindarajan (2009) also speaks for the local teams. According to him, local teams can learn fastest the unknowns and resolve uncertainties through experiments. Self-organization happens when local teams exchange information, take actions, and continuously adapt to local markets instead of the imposition of an overall plan by top management. Accordingly, the focus of management should be shifted away from a delivery capability to interaction capability.

Promote emergence

Emergence refers to high-order structures that arise from the interaction of systems components. Emergence is an interactive process which creates an emergent whole that is more (or less) than the sum of its parts (Mitleton-Kelly 2003). The emergent entity is not just composed of constituent parts. Emergent entities can interact with the parts from which they emerged. The process known as downward causation means that the emergent entity also exerts some degree of influence or constraints on its components (Blitz 1992).

There where self-organization emphasizes the process of increasing and decreasing information in a beneficial way, emergence directs the attention to the structures that simultaneously arise from and fuel self-organization. While Zeschky et al. (2014) stress the importance of the locality of reverse innovation, they also argue that local development teams need access to corporate resources such as technological know-how, existing platforms and corporate marketing and sales. Similarly, Govindarajan (2012) emphasizes change "from below and above", by which he means the two-part approach where local teams generate ideas from below and top management orchestrates changes from above. Reverse innovation emerges through local interactions but not in an organizational vacuum. Assumptions, values, beliefs and practices create the organization's innovation culture which influences on what can and what cannot emerge. Innovation culture is enacted through feedback processes, which are crucial for the emergence of reverse innovation for two reasons: positive feedback stimulates ideation and increases local teams' degrees of freedom, while the role of negative feedback is to balance local ideas with strategic goals and help to create a route from opportunities to market.

Embrace diversity

Diversity refers to a state or quality of being different in some way. Diversity is seen as prerequisite source for unpredictable self-organizing and the emergence of novelty. Many scholars have argued that without diversity there is no difference that makes a difference (e.g. Holland 1995, Mitleton-Kelly 2003.)

Reverse innovation is innovation with the local people, not for the local people. Govindarajan (2012), for example, has stressed that reverse innovation embraces emerging-market knowledge and expertise in way that shatters the dominant mind-sets in MNCs. Instead of educating product designers about local needs and "parachuting them into an emerging market for a few days", reverse innovation calls for engaging potential innovation adopters at the beginning of design process (Winter & Govindarajan (2015). Similarly, Zeschky et al. (2014: 271) have pointed out the importance of a 'frugal mindset' which "is best developed by maintaining an R&D unit in a resource-constrained environment that exposes engineers to the severe living conditions of poor customers". Zeschky et al. (2014), Winter & Govindarajan (2015), and many others speak for diversity as it helps to generate innovation initiatives which fit with their context. The more diversity within the initiators, the more absorptive capacity (cf. Cohen & Levinthal 1990)

they have and the less susceptible they are to confirmation bias (cf. Nickerson 1998). Diversity feeds the polyphony of perspectives (Hazen 1993), which is extremely important for reverse innovation, because it helps to make sense of local needs, wishes and constraints and lays the foundation for the legitimacy of innovation.

Support co-evolution

A system's survival depends on its ability to adapt to the evolution of one domain or entity, which is partially dependent on the evolution of other related domains or entities (Mitleton-Kelly 2003).Co-evolution builds on connectivity within the system and between the system and its environment points out that actions by any actor may affect (constrain or enable) the related actors (and systems).

The rationale behind reverse innovation "is not that people in developing countries are willing to accept lower quality and products based on sunset technologies" (Winter & Govindarajan 2015). Instead, reverse innovation builds on the idea of creating "optimal solutions, not watered-down ones, using the design freedoms available in emerging markets" (ibid.). Similarly, the co-evolution argument highlights the importance of the identification of enabling and constraining factors. Reverse innovation is not an island. Quite contrary, they are initiated, designed and adopted in a particular context with many interconnected elements. To understand social and economic factors, Govindarajan (2012) suggests an ethnographic approach (Govindarajan & Euchner 2012). To him, traditional market research based on questionnaires has no value. Instead Winter & Govindarajan (2015) encourage to observe potential users in their everyday environment and study the pros and cons of the technical landscape. This enables not only the identification of problems but also creative solutions to solve them.

Exploit attractors

A complex system co-evolves with its environment through various serial phases, but its behaviour is limited by dominant attractors. An attractor is a dynamic organizing principle, a kind of magnet to which a system's behaviour converges over time (Holland 1995). Sometimes a system may undergo a significant type of change, a phase transition into a new phase dominated by different attractors (Nicolis & Prigogine 1989).

Due to attractors, each system has its own characteristic set of behaviours, assumptions and cognitive patterns (Mitleton-Kelly 2004). Attractors can inspire thinking differently, support ideation and promote continuous change. On the other hand, they may also produce functional (how things are done), cognitive (how things are seen) and political (what is seen possible) lock-ins which limit the ability to change (cf. Grapher 1993). Reverse innovation is a difficult endeavour as it challenges many presumptions about how innovations are initiated, designed and implemented. It also asks casting off many existing practices. Winter & Govindarajan (2015), for example, found out that innovation designers in MNCs "struggle to get away from existing technologies" and face it difficult to digest "the idea that time-tested products, with modifications, won't appeal to lower-income customers". The resistance to change the mind-set can be rooted deep in organizations and therefore Govindarajan (2012) speaks for setting audacious targets and clear communication from the top management. In complexity language, there is a need for attractors which sponsor phase transition that breaks symmetry and provides multiple new choices. The system's dominant behaviour must be perturbed before a "reverse-innovation friendly" attractor can be set.

Conclusions

It can be argued that reverse innovation builds on effectuation logic (cf. Sarasvathy 2001). This is to say that reverse innovations emerge through the local processes where a set of means is given, and the focus is on selecting between possible effects that can be created with that set of means.

Reverse innovation is a resource-constrained innovation with potentially transformational consequences for many industries and provides new opportunities for industry frontrunners. Reverse innovation also

represents a paradigm shift as it has changes how innovation is framed and questions many assumptions related to creation, adoption and diffusion of innovation. Perhaps reverse innovation requires a kind of 'skin in the game' attitude (cf. Taleb 2018: 24), i.e. accepting that "you may not know in your mind where you are going, but you know it by doing" it is in a form of learning by doing.

This chapter suggests that complexity thinking provides a potentially useful approach to reverse innovation as it helps to understand the emergence of innovation through the process of self-organization. It explains how reverse innovations are always enabled or constrained by social, economic and technological factors in the particular context. It also provides insights on how these constraints can deal with diversity and how attractors can deliberately be used for promoting a reverse innovation mindset.

The chapter concludes with the following five propositions: i) self-organization promotes reverse innovation by improving the ability of local people to exploit contingencies, ii) reverse innovation emerges when local initiatives resonate both with local needs and the organization's strategic goals, iii) diversity enables a polyphony of perspectives and supports the legitimacy of reverse innovation, iv) co-evolution points to the systemic nature of reverse innovation and highlights intrinsic design freedoms in emerging markets and v) the reverse innovation mindset can be promoted through a strategic use of attractors.

Taking complexity seriously means accepting that in trying to build a representation of enabling conditions for reverse innovation, the picture is necessarily incomplete (cf. Cilliers 2005). Managing reverse innovation is art as much as science (cf. Richardson 2008). However, we can comfort ourselves with the idea that knowing something that is very likely true is better than knowing nothing at all.

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