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STRATEGIC TENSIONS OF SMART DEVELOPMENT

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Abstract. The paper discusses the inherent paradoxes and contradictions of smart development. Reconciling the opposites lies at the heart of "smart" approach to management and governance of the complex social systems. Smart development calls for finding the "golden middle" solutions by matching the top-bottom and bottom-up approaches, order and spontaneity, hierarchies and markets, bureaucracies and adhocracies. It is about building the right "architecture of choice" for the diverse actors in socio-economic system, taking into account their behavioural patterns and applying the appropriate incentive schemes. Encouraging the behaviour of smart "swarms" and applying the "nudges" are often more effective ways of solving the complex social and organizational problems. The proposed approach relies on the theoretical insights of the development of complex adaptive systems, which remains largely underexplored in the field of management and development studies. The paper claims that "smart" development is no panacea, but is particularly important for solving the complex problems where no linear approach is possible.

Keywords: smart development, complexity, complex systems, complicated systems, complex adaptive systems.

JEL classification: R110.

1. Introduction

The complexity and uncertainty of social environment calls for rethinking the established managerial approaches. In recent years we have seen the proliferation of academic research on networks, social embeddedness, as well as biases and irrationalities in the economic decision making. Much of the critique goes to the prevailing organizational designs and the managerial mindsets that disregard the complexities of work environment and impose on the rest of society (and organizations) the simplistic and linear solutions that often only reinforce the problems they are supposed to solve.

We can see the growing body of literature on *smart systems*, which largely originates from fields of engineering and have rather recently entered the sphere of social sciences. The "smartness" of technical system is generally characterized by *closed loop control*, *energy efficiency* and *networking capabilities*. Smart systems are flexible, self-adjusting and open to the external environment while at the same time making an efficient use of the internal resources. Such characteristics of "smartness" can also be transposed into the social systems, but with certain care.

It can be argued that despite some common ground, the smart development of technical and social systems needs to take into consideration the different nature of both systems.

The *aim* of this paper is to discuss the strategic tensions that enable or discourage the smart development of social systems. The paper conceptually draws on the aspects of systems and complexity theories, with a particular emphasis on complex adaptive systems approach.

First, it is argued that smart development primarily depends on the type of system under consideration. Social systems are primarily described by their complexity.

Second, the relationship between the types of strategic tensions and the level of system complexity is discussed.

Finally, the main strategic tensions confronted by the conventional management while adopting the smart development approach are presented and discussed.

2. Smart development for what type of system?

Glouberman and Zimmerman (2002) provide an illustrative distinction among the *simple*, *complicated* and *complex* problems.

Simple problems have possible recipes that can be repeatedly used for solving other similar simple problems. Such recipes are easily replicated, expertise is helpful but not necessarily required, solutions tend to the standardized and their outcomes are predictable. Baking a cake is often presented as an example of simple problems.

Solutions to *complicated* problems rely on formulas (rather than recipes) and high level of expertise. Knowledge acquisition and learning from experience plays an important role because successful solution of one complicated problem (e.g. sending a rocket to the moon) increases the chances of future successes in the area. The complicated systems can be reduced to observable and often quantifiable patterns. A certain influence on one part of the complicated system, such as the rocket, will produce the expected results on the system level. Thus, complicated systems can be with a degree of predictability shaped by changing or replacing their elements.

Complex problems, on the other hand, show limited use of recipes and formulas. The expertise also plays a limited role in solving the complex problems. Success at solving one complex problem can hardly be replicated and extended into solving another complex issue. A common example of complex is the raising of a child. In this case, each child is perceived as a complex system with unique combinations of genes and experiences, and their connections. Raising one child provides no guarantee of success in raising another child due to the complexities involved. Unlike complicated systems, the complex systems cannot be predicted or shaped into any predictable "ideal" state. Most social systems fall into the category of complex systems, or more specifically, the complex adaptive systems.

The Cynefin Framework proposed by Kurtz and Snowden (2003) adds to the above mentioned system typologies. It distinguishes among four different systems based on the level of "knowability". *Simple* systems are characterized by clear causality and belong to the area of "known". *Complicated* systems are associated with the area of knowable or "known unknowns", which (e.g. causality) can be discovered through in-depth analysis. *Complex* systems belong to the area of "unknown unknowns" where no linear causality can be discovered among the numerous elements and their multiple interactions. Managers can contribute to the emergence of such systems through multiple small and diverse interventions. Finally, *chaotic* systems are considered as falling within the area of "unknowable", where it is almost impossible to trace the causality and the best managers can do when dealing with such systems is to undertake single or multiple actions to stabilize situation (and turn chaos into complexity).

Management of social systems is essentially about the managerial interventions in complex (adaptive) systems. However, many of the established theories in management and governance are shaped on the premises of *complicated* rather than *complex* systems. It means that social systems (e.g. organizations, industries) are being decomposed into elements and recomposed into the idealized models disregarding the complex linkages and emergent nature of such systems. The managerial hierarchies that are embedded both in private firms and public governance are generally suited to the complicated systems (e.g. solving the engineering problems or in organizational environments with high safety requirements), but are counterproductive in the context of complex adaptive systems (e.g. reforming and running the systems of education, healthcare, solving the criminal problems of society or creating the innovation ecosystems). They call for a very different approach than the one that persists in traditional (and even modern) management, but it is hard to achieve given the prevailing organizational / institutional structures and mindsets.

Therefore, this paper discusses the main strategic tensions surrounding the "smart" development of complex social systems.

3. Strategic tensions and levels of complexity

The discussion on strategic tensions is closely related to the aforementioned typologies of systems. The strategy process is very often confronted with the opposing pressures towards one of the extremes and it is very often about finding a proper balance or "middle ground" on certain continuum (e.g. centralization vs. decentralization of decision power and responsibilities). De Wit and Meyer (2004) set out four general ways of approaching the strategic tensions that can be linked with the aforementioned different levels of system complexity:

- Strategic tension as a *puzzle* is a situation where the optimal solution is possible. Such situations call for in-depth analysis and higher level of understanding. Thus, it is possible to consider the strategic tensions in terms of puzzle when dealing with *simple* and, to some extent, *complicated* systems, i.e. even construction of complicated machinery, such as rockets, can be considered as achieving the optimal configurations of elements in the "puzzle". However, the more complicated the system, the more internal contradictions it tends to have, which implies the possibility of more than one "optimal" solution.
- Strategic tension as a *dilemma* reflects better the situations that are encountered in the complicated systems. Dilemma implies the pressure towards two possible solutions, yet each with potential drawbacks and negative externalities. Thus, dilemmas are often perceived as "inevitable evil" in the decision making. For example, it is quite

natural to approach the technical systems in terms of contradictions (e.g. increasing strength tends to increase weight of the existing system). Resolving the dilemma basically implies taking the sides, which managers, especially when dealing with the complicated systems, tend to avoid. However, there are certain situations when making the uncompromising decisions becomes hard to avoid. Firms often have to choose "one side of the coin" and to accept its potential side-effects. For example, giving preference to certain key success factors over the others may be driven by the necessity of building a clear and distinctive strategic profile of the firm. Time pressure also plays an important role in opting for "either or" decisions.

• Strategic tension as a *trade-off* is probably the most frequently encountered way of approaching the management problems in business and public governance. It is a problem situation in which there are many possible solutions, each striking a different balance between two conflicting pressures. It means that the choice is not so much *either or*, but *how much of* each available option we are ready to consider. For example, how do we balance the reliance on internal and external sources of growth? How much do we promote competition and to what extent and in what instances do we prefer cooperation in our system? There can be multiple solutions to the trade-off type situations depending on where we put the imaginary point of "balance". The traditional preoccupation of the economists with the opportunity costs is also a reflection of trade-off situation. Management of complicated systems (e.g. big engineering projects) is centered around the trade-offs where the compromises across the different technical parameters and subsystems appear to be inevitable (i.e. reconciling the above mentioned contradiction between weight and strength or between speed and inertia). However, compromises might not always lead to the most effective and efficient solutions.

• Strategic tension as a *paradox* calls for the highest order of mental activity and is most of all applicable to problem solving in the complex systems. Paradox is a situation in which two seemingly contradictory factors appear to be true at the same time. Unlike in previous cases of "puzzle", "dilemma" or "trade-off", there are no clearcut solutions. In the aforementioned situations we approach the context through its limitations – the decision maker is bound by the constraints of the system. Addressing the situation as a *paradox*, on the other hand, stimulates the creative thinking beyond the existing contradictions and alternatives. Various methodologies of creative problem solving stress the need to eliminate contradictions that limit the search for possible solutions. For example, TRIZ theory for inventive solving of technical problems emphasizes achievement of "ideal final result" without compromising the seemingly contradictory parameters of the system. What represents a problem and limitation in one instance, can become an opportunity in another situation and another mindset. According to TRIZ, ideally, the problem gets solved by itself, i.e. the same aspects that represent a problem are used for solving it. It means that when problem is approached in this way, no additional energy or resources are wasted – the internal resources inherent in the problem are used for solving the problem. It is fully in line with the fundamental aspects of "smart systems", such as *closed loop control* and *energy efficiency*.

Thus, the "smart" approach to development has to take into consideration several key aspects.

1) First, any system-level intervention that could be considered as being "smart" should acknowledge the nature and type of the system it is dealing with. In other words, smart development is based on the recognition that different systems call for different managerial mindsets. The instruments that are appropriate for developing the complicated system will often be counterproductive when developing the complex system. On the other hand, there is no need to approach the complicated systems in complex manner if more simple and resource efficient solutions are at hand.

2) Second, the development of social system is in most cases very different from the development of technical system. Although both systems can be regarded as complex systems in their own right, it is often hard and even risky to rely on the same pattern of thinking. The creative development of technical systems (e.g. TRIZ) relies on describing and reaching towards the "ideal final result". In the context of social systems, the very presence of "ideality" can be questioned and even considered dangerous for its disregard of social complexity. Thus, despite being inspired by the developments in smart technical systems, the "smart" development of social systems cannot be based on the same mental models and approaches. Even the common analogies with biological ecosystems (in the context of complex adaptive systems) have to be dealt with care. Social systems are first and foremost systems of humans with their unprecedented capacity for self-reflection, individual and collective learning, which sets them apart from any natural systems.

3) Last but not least, smart development of social system recognizes its complex adaptive nature, which is characterized by inherent tensions and contradictions:

• *hierarchical arrangements of autonomous decision makers and distributed control.* Metanorms of the group are often more influential on system's behavior than centrally imposed laws. Extreme centralization of governance leads to faulty feedbacks. Extreme localization, on the other hand, may lead to the exhaustion of collective resources (e.g. "tragedy of the commons", Hardin, 1968)

• *connections* among the components that vary in terms of their degree and intensity. Individuals maintain numerous dynamic relations, but interact primarily with those around them (i.e. most relations are short range). Both inadequate connections and overconnectedness of elements may complicate the system's adaptation to internal and external changes. On one hand, the lack of connections inhibits coordination; on the other hand, excessive connectivity may lead to an overload of conflicting inputs (Kauffman, 1993). High interdependence coupled with poor quality of relations leads to potential conflicts in the system. Too many species and too many connections may prove as destablising to the system as too few of them. System managers, therefore, often create subsystems as "pockets of collaboration" that spread throughout the system. However, conventional management still finds it hard to accept that relationships in the system are non-linear and unpredictable (Cilliers, 2000).

• *flexibility* and *self-correction* means that systems are composed of many related elements and the loss of one element in the system may be compensated by the other elements that spontaneously reorganize their activities. Such spontaneous reorganization even creates niches where none have existed before. Thus, a functioning complex adaptive system has an effective and flexible internal error management system. Such pattern challenges the conventional role of managers in organizations and represents a considerable tension between the natural system dynamics and traditional management hierarchies (both in business and policy).

• *circular causality* and *self-organization* means that complex system emerges naturally, without centralized external intervention and maintains its essential identity even when undergoing non-linear transformations. Every complex adaptive system has so-called *order parameters* that have disproportionate influence on other elements of the system (e.g. profit is an accepted order parameter in business organizations). Self-organization often leads to the emergence of minority clusters or "local majorities". Building the critical mass is one of the key management challenges in achieving the new equilibrium of the complex system (e.g. causing the attitude change in the system). The self-organization is often self-reinforcing through the positive feedback loops (e.g. snowball effects). The feedback loops are also responsible for the co-evolution of system and its actors (i.e. changing actors influence the changes in the system, which in return causes changes in actors). Managing the feedback loops and building the critical mass becomes a crucial management competency in such fields as standard setting (i.e. locking-in the customer in company's standard) or urban and cluster development (i.e. building productive concentrations of actors through targeted influence on the key areas where "success breeds success").

4. Complexity aversion in conventional management: tension-based approach

The traditional approach to development has not been comfortable with the complex adaptive systems theory. From management perspective, the social systems remain to be widely (mis)treated as *complicated* rather than *complex* systems. Management decisions are still largely focused on reductionist rather than holistic approach, on averages rather than outliers, on elements rather than their relationships, on big changes rather than small important changes, on search for a single rather than multiple causes of underperformance. Thus, mechanistic solutions are still largely preferred in systems that are quite organic in their nature. Wide spread perceptions of linear causality instead of multiple interconnections represent a serious drawback of modern policy making in the complex systems. However, for smart development to take ground there needs to be a fundamental switch from the hierarchical to network-based model of governance – not only in terms of structures, but mindsets as well. The management of complex adaptive systems is based on sensemaking, learning and improvisation (McDaniel, 2002), not command, control and planning that are characteristic of traditional management (Morgan, 1996).

Let us briefly discuss some of the key tensions that prevent conventional management from embracing the complexity and adopting the smart approach to development.

Hierarchical decision structures vs. network-based systems

Goldspink (2007) distinguishes between the traditional hierarchical system and loosely coupled system of governance. One of the key strategic

tensions is the persistence of hierarchical structures in the systems that are highly complex by their nature. It leads to the production of top-bottom solutions that have little acceptance and effect on the system actors. However, research on successful institutional reforms shows that mobilization of stakeholder groups plays key role in their success. Loorbach (2010) emphasizes the role of fostering a collaborative environment throughout the system by actively encouraging opportunities for interaction in order to make systemic reforms self-sustaining. Most organizations opt for managerial control instead of building the long term trust-based relations with the employees and external stakeholders. Goddard and Eccles (2012) notice that the so-called "professionalization of management" and hiring of expensive "managerial talent" in order to solve the perceived organizational problems deprives the employees of their organization (i.e. they lose the sense of co-ownership) and usually is a sign of poor organizational design. It ignores one of fundamental assumptions of complex adaptive systems – that the quality of relationships may be more important to systems performance than the quality of agents (McDaniel, 2002). Reliance on purely economic incentives and contract-based relations usually is considered as a failure in the management of complex systems where trust, identity and meaning play the key role.

Managerial short-termism vs. long term system dynamics

Timeframe presents a significant tension for the decision makers both in business and politics. In businesses, the systems of corporate governance (i.e. owners, stockholders) put pressure on managers to produce fast and tangible results (e.g. profit), often at the expense of long-term growth of the firm. It is particularly true in the systems that are centered around the shareholder (rather than stakeholder) value. In politics, the policy makers are affected by the election cycle that determines their focus on the short run effects in decision making. The policy planning techniques also favours the focus on narrow short-term solutions to complex problems, e.g. installing metal detectors at school entrances to fight violence at schools. On the other hand, the development of complex system calls for long-term orientation because the focus on the short run effects can have negative system-level externalities for the long run. Thus, smart development of social systems is in a continuous tension between the inherent managerial short-termism and long-term system dynamics. Such tension can be only reduced by switching towards greater stakeholder involvement. No quick reforms of social systems can ever be sustainable if they do not receive support and legitimacy from the most important stakeholder groups. The decisions made in the closed circles of "professionals" and enforced upon the dissenting majority have little chance of taking hold in long run.

Causal mindsets vs. interconnected contexts

Conventional management thinking is focused on identifying and repairing the "bottlenecks" or building on the "key success factors". Such mindsets stem from the belief in the power of analysis and control by the professional management. The above mentioned time pressure conditions the managers' focus on elements rather? than their relationships. It is much easier to identify the main "leverage points" than to spend time understanding their systemic relationships. Therefore, many organizations end up discovering the wrong causes to their failure or success. Even if they grasp the right "leverage point" and press on it without properly understanding the context and interconnections, they often end up with unintended consequences. Focus on causality is one of the aspects of management (originating from scientific management and military strategy) that causes failures in the complex environment. It is not only due to the external conditions, such as pressure on time and results, but also due to the internal reasons, such as managerial mindsets. One of the founders of system thinking Jay Forrester of MIT notices that the situation is likely to change when people with the educational backgrounds in information systems and other fields with more tolerance for complexity take power in modern organizations. The growing importance of ICT, its role in business and the thinking it spills over into the means that connectivity is gradually challenging linearity even in the modern management textbooks.

Thinking big acting big vs. thinking big acting small

Researchers on the management of complex systems stress the importance of modest interventions while seeking the systemic improvements (Arthur, Durlauf, Lane, 1997; Kauffman, 1995) or "small wins" (Weick, 1984). However, relatively few managers share the approach that big systemic changes can be brought about by adopting the strategy of small wins. Little attention is paid to the potential of positive spillovers from one area to another by changing some key elements that in return cause the positive cascade in the system.

The managers and policy makers tend to ignore the cascading properties of complex systems. For example, Snyder (2013) discusses the application of complexity theory to education reform and notices that it may be "not necessary to launch sweeping reforms tackling whole educational systems if the right levers of governance can be identified and triggered". As already mentioned, conventional managers are firm believers in finding the "leverage points" that would push the system in required direction. However, system researchers (e.g. Meadows, 1997 citing Jay Forrester) notice that once the analysis is carried out and the leverage points are detected, managers then rely on the linear mentality and push on the right leverage point only in the wrong direction. Meadows (1997) provides an example of *growth* as a commonly perceived solution to the major global problems, such as poverty or resource depletion, although growth is responsible for many of such problems. Relying on intuition when dealing with the complex systems is of a limited use because they are counterintuitive. Snyder (2013) also warns of avoiding the small tipping points that fix only narrow problem of development. Focusing on one key area is never a solution to the problems of complex system. Snyder (2013) claims that in order to nudge the system towards desired outcomes, pressure should be applied to as many key points by as many actors across as many levels. Thus, big systemic changes occur when many stakeholders are empowered to do small changes in a desired direction. It calls for a significant paradigm shift concerning the role of managerial control.

Action and control bias vs. empowerment of self-organization and learning

Last but not least, modern managers are faced with the dilemma of managerial control vs. empowerment of self-organization and organizational learning. Goddard and Eccles (2012) notice that the horns of the managerial dilemma are the need to be in control and the need to be continuously learning. On the control side, managers are expected to minimize the things going wrong, focus on threats stemming from competitors, introduce discipline and improve the existing activities. On the learning side, managers are expected to maximize the things going right, minimize internal organizational myopia through learning, encourage creativity and promote new areas of growth. Thus, managers are confronted with the need to accomplish two parallel, yet very often conflicting tasks – administration and innovation. The first part of the dilemma belongs to the realm of complicated, whereas the second to the complex systems. As already mentioned, traditional managers are much better trained and equipped to solve the first type of problems, whereas solving the growth-related problems calls for a very different mindset. This dilemma has been from various angles discussed by numerous researchers using different yet related concepts, such as *ambidextrous organization* (Smith, Tushman, 2005; Raisch, Birkinshaw, 2008), *innovator's dilemma* (Christensen, 1997) or *Performance Engine vs. Innovation Team* dilemma (Govindarajan, Trimble, 2010). The authors are not fully unanimous regarding the potential ways of managing this tension. Some researchers (e.g. Christensen, 2003; 2011) treat it as a dilemma (i.e. "either or" solution) and support the idea of separating these two quite different functions and mindsets, even into distinct organizations. Other researchers (e.g. Govindarajan, Trimble, 2010) regard this tension more as a paradox where *both* the Innovation Team and the Performance Engine of organization need to be integrated (rather than separated) in order to achieve sustainable growth.

The complexity approach suggests that manager is only capable of indirect control of the social system and is much better off as motivator and coordinator of collective learning (Goddard, Eccles, 2012). Managers have to foster collaborative environment by actively creating opportunities for interaction, design ways for continuous collaboration and organizational learning, engage multiple stakeholders in order to build "collective capacity" that enables ordinary people to accomplish extraordinary things and generates their commitment (Mourshed et al., 2010 in Snyder, 2013). However, enabling such self-organizing "smart swarms" (Miller, 2010) through "positive linking" (Ormerod, 2012) is very often obstructed by the still prevailing structures and mindsets. The role of manager as "architect of choice" who nudges the behavior of stakeholders in a desirable direction rather than the one who imposes the position and seeks to own the outcome is still a rarity both in business and policy making.

5. Conclusions

The perspectives offered by the theory of complex adaptive systems are useful for management and development of the modern social systems. However, they still remain underused in practice. Several important conclusions can be drawn from the discussion above.

First, "smart" approach in management is first of all about adopting the mindset that is adequate to the nature of the system. Understanding what tools and approaches are appropriate for what type

of system is the key precondition of any smart development.

Second, the development of complex social systems is not about finding ultimate answers to the pressing issues, but about continuous management of tensions and contradictions that can never be fully resolved.

Finally, smart development of social system is not so much about building the "right" structures and processes, but about causing the behavioural changes at the collective level (i.e. organization, society). It means involvement of multiple stakeholders, building the environment of trust and coordination of learning processes.

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