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RESPONSIVE DYNAMICS AS THE SOURCE OF ORGANIZATIONAL AND SOCIETAL ADVANTAGE

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Abstract— Contemporary studies must address the challenges of responding to abrupt events in highly dynamic and complex environments. We argue that decision structures and information processing capabilities enhance the ability of organizations and societies to respond effectively to the changing conditions for durable advantages. Sustainable performance arguably derives from interactive decision-making processes that deal with opportunities as they emerge informed by updated environmental analytics. The combination of experiential insights from decentralized responses and forward-looking reasoning at the center identifies a dynamic adaptive system of interacting fast and slow processes. The fast information processing observes local environmental stimuli whereas the slow information processing interprets these events and reasons about future developments. When the fast and slow processes interact they form a dynamic system that allows an organization or society to adapt gradually to the turbulent conditions. We apply the model of fast-slow interactions in organizations and societies as the key driver of sustainable adaptation.¹

Keywords— *adaptation; collaborative learning; dynamic systems; fast and slow processes; organizational culture; strategic responsiveness*

I. INTRODUCTION

Sustainable performance arguably derives from the ability to commit resources within structures that are conducive to dynamic adaptation with status quo being modified by innovative responses to environmental changes [1][2]. It calls for proactive behaviors combined with economic optimization consistent with concurrent calls for exploration and exploitation [3]. The ability to accommodate emergent responses with a general appreciation for the strategic intent is important to understand complex decision-making processes and the ability to generate superior outcomes [4]. The challenge seems associated with a combination of autonomous experimentation at low-level decision nodes and high-level analytical strategic reasoning. The associated information processing processes are important to observe ongoing environmental events, interpret them, and make sense of the evolving changes at an aggregated level [5].

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In this context, adaptive systems may derive from locally dispersed responses to emerging threats and opportunities that generate experiential insights and valuable updated information for the analytical higher-level sense-making process. This perspective resonates with Tsoukas and Chia's [6] referral to organizational becoming where dispersed actions interact with managerial attempts to make sense of the changing conditions and forming a cognitive representation of the environment. It also corresponds to Whitley's [7] reference to a gradual move in organizational studies towards institutional frames for coordination of skills, delegation of authority and joint problem-solving practices away from formal hierarchies. We build on these perspectives to develop a dynamic responsiveness model relevant to contemporary organizations and societies. This work contributes to the management field specifying a new model for effective responsive dynamics in social contexts.

In the following, we first introduce the idea of fast and slow processing as a necessary precursor for effective dynamic responses to ongoing changes in evolving path-dependent and non-recursive environments. It argues for joint problem-solving and collaborative learning as essential traits of effective behaviors in successful adaptive organizations and societies. These interactive approaches are explained based on insights from modern cognitive science to reason for the essential relationships in a dynamic responsive system. Finally, we discuss the implications for organizations and societies in general.

II. BACKGROUND

The basic elements of human cognition are comprised by fast multifaceted processes of actions and reactions in the surroundings and slow processes that interpret the experiential insights gathered from many encounters with the environment [8]. This combination of fast and slow information processing develops a deeper understanding of the evolving environmental context that gives meaning and purpose to the activities carried out. Fast actions taken in various places to ongoing events create many reactions that are observed and interpreted in analytical forward-looking time-consuming and hence slow thought processes. The interaction between fast

and slow information processing creates a system of dynamic interaction between insights from dispersed observations and updated higher-level understanding of the changes [9]. This dynamic of fast-slow information processing system illustrates the importance of interactions between dispersed individuals operating in the field and more centrally located interpreters and thinkers. The many individuals that execute the daily activities and local managers observe the environmental changes first-hand as things are carried out and see the ensuing reactions. These impressions are transmitted to inform the central forward-looking deliberations to interpret and understand how things are evolving.

This is partially reflected in the concept of *interactive strategy-making* combining elements of central planning and decentralized responses [10]. Strategy-making is often conceived as a cyclical process of planning, execution and monitoring typically performed in an annual cycle. The strategy process is projected as a rational analytical approach to understand the environmental context and outline a direction for future activities [11]. It consists of cyclical process elements of setting long-term goals, conducting environmental analyses, developing short-term action plans and engaging in strategic control processes.

The diagnostic control process implicates a learning loop where realized outcomes are held against intended plans periodically pointing to needed corrective actions and initiatives in the subsequent planning cycle. The process is high-level instigated around leaders and top management to underpin the reasoning about strategic direction based on analyses of the environmental context. When individuals and lower-level operating managers can act to experiment while voicing their opinions, the responsive actions can be taken quickly by local decision-makers and the relevant insights can be heard by top management. The responsive actions generate experiential insights on what might work, and what not, within relatively short periods of time thereby creating information about the changing environment.

The experiential insights gained by many dispersed individuals from fast responses constitute updated information about ongoing environmental changes that can inform the slow forward-looking analytical thinking at the center. Hence, the fast local responses should interact with the slow forward-looking thinking at the center and vice versa to ensure that the slow thinking process deliberates on the basis of current information. The slow thinking process can develop a more informed cognitive understanding of the changing environment based on the updated experiential insights when people from the field engage in the deliberations [12]. This thinking process can be seen as a discourse that reconciles diverse insights and forms a common understanding of the environment to guide on-going decisions [13].

The combined fast and slow processes can stimulate an underlying *dynamic system* that depicts an organizational ability to take responsive actions. Such a dynamic system is meta-stable without equilibria and displays continuous

movement [14]. A combination of fast and slow processes can create a dynamic system that is conducive to non-linear adaptive organizational movements over time. A dynamic system is better suited to drive activities towards responsive moves in new thoughtful directions that can adapt the current way of operating in line with the changing context. An integrative or interactive structure that combines slow forward-looking reasoning with local insights from dispersed responses can be construed as a dynamic adaptive system that forms effective response capabilities [15].

III. THE NEED FOR CONNECTED FAST-SLOW SYSTEMS

It is argued that the left hemisphere of the human brain is the location for many aspects of slow information processing whereas the right hemisphere is associated with key features of fast information processing. McGilchrist [16] observes that “in cases where the right hemisphere is damaged, we see a range of clinically similar problems to those found in schizophrenia”. From this it seems like schizophrenia is associated with an imbalance in favor of the slow system where it no longer is fed with updated experience-based impressions from the fast system. This condition can be characterized as hyperconsciousness and one-sided abstract thinking where attention to the context is missing. We argue that this logic can be transposed to the social contexts of larger groups including organizations and societies.

Rosenzweig [17] concludes in his schizophrenic tour de force across popular business writings, that the perceived influence of controlled analytics-based leader-driven management practices is vastly exaggerated. We also know that executive decision-makers may assume cognitive biases that lead to ineffective outcomes because they are caught up in their own past beliefs and not being cognizant of the weak signals in the periphery right in front of them [18].

In an irreversible evolving and non-repetitive con, the common linear prediction models fall short as well as the unpredictable nature of events defeats the precision of more sophisticated time-series models. Hence, these kinds of turbulent environments need frequent updating of the current understanding of the changing context from new experiential insights generated at many dispersed operating entities throughout the organization or society (Figure 1).

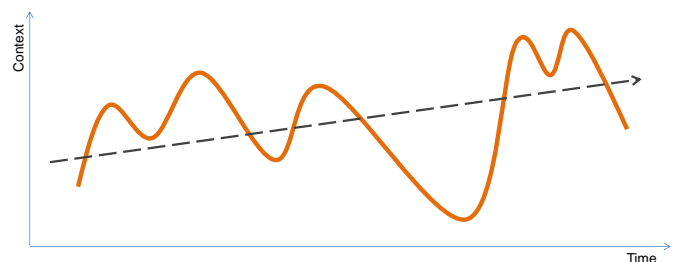


Figure 1. A Turbulent Context Needs Updated Insights about Changes

Central planning activities must be connected to the learning and experiential insights gained from decentralized actions [19]. In these social contexts we may identify comparable

schizophrenic disorders when fast decentralized experiential information processing is dissociated with the slow central interpretive information processing. So, the slow system at the center continues to deliberate on the basis of beliefs from the past without being updated by new experiential insights from the changing environment.

IV. FAST-SLOW INTERACTION AND LOOPING EFFECT

The interaction between the fast and slow information processing implies an active interface between forward thinking and current experiences in the surrounding environment. In social contexts human culture will influence how these information processing activities interact. Organizational culture is defined as “a set of structures, routines, rules, and norms that guide and constrain behavior” [20]. It is a dynamic phenomenon created by interaction among individuals shaped by leadership. Schein [20] argues that organizational culture starts with a leader imposing his/her values and assumptions on a group of people. If the assumptions are invalidated by changing conditions in reality, the leaders must ensure that the group adheres to adaptive change processes.

At an organizational level, norms and values embedded in the culture influence the way people think and behave. At a community level, the traits of regional or national cultures influence the way people think and act in that particular society. So, culture is an inseparable part of human development and actions taken within a given environmental context. Individuals are shaped and classified by culture as well as they in turn shape and classify the surrounding culture. This reciprocal interaction is referred to as a *looping effect* [21]. Individuals in a social network abide by certain rules, but the individuals also shape the network while the network also shapes them. These human networks can “exhibit complicated, shared behaviors without explicit coordination or awareness” [22]. Cultural neuroscience focuses on how thinking and actions vary according to the culture in specific groups and investigates how content is communicated and distributed among people in groups, organizations and societies [23]. The collective cognitive capabilities implied by this can develop distinct behaviors with heterogeneous response capabilities to environmental changes.

Hence, a network of communicating individuals can form a collective intelligence without a formal control center with non-linear emergent properties that defy simple aggregation [24]. Hence, creativity and innovation is more than an individual mental activity as “it arises from the synergy of many sources and not only from the mind of a single person” [25]. Hence, it is easier to facilitate creativity by changing the social conditions than trying to make individuals think more creatively. Innovative behavior depends on a setting of creative surroundings with the right stimuli for interacting networked individuals. The involvement of individuals and their ability to take initiatives when conditions change are important for the ability to respond and adapt. An exclusive top management perspective discards the significance of

dynamic interaction between individuals at lower hierarchical levels and hampers a fast and slow information processing dynamic.

Cognitive capability deals with the ability of individuals to learn and use acquired knowledge to improve everyday routines. However, in a social context it also relates to the ability to engage in larger integrative initiatives for the organization or society where the consequences in complex and ambiguous situations are beyond the means of single decision-makers. The conditions require other cognitive attributes such as intense collaborative efforts between many individuals due to the limits of the individual cognitive architecture. The amount of information required to solve highly complex and ambiguous problems exceeds the working memory capacity of single individuals [26].

Cognitive capabilities in organizational settings are concerned with how individuals acquire and handle knowledge in a social context. People store information in memory as *implicit* knowledge based on evolutionary elementary skills such as means-end analysis and experiential heuristics. This reflects ‘knowing how’ to go about something based on experience even though it cannot be expressed and thus resembles the concept of tacit knowledge [27]. This works fine when individuals perform routine tasks, but when unexpected problems arise under unfamiliar circumstances there is a need for generalized knowledge expressed in an *explicit* way. Explicit knowledge can be captured in verbal descriptions and stored in internal information systems. Dealing with ambiguous and unknown situations requires access to different types of explicit knowledge employed in non-routine approaches that generate ideas and create insights from new task experiences [28]. That is, when issues are complex and uncertain the limitations of cognitive load can be circumvented by learning collaboratively from different people with diverse knowledge and insights about how to deal with the emerging problems [29].

The interaction between slow and fast information processing among people in a group is by nature collaborative and requires a certain cognitive tension among the individuals. There is a need for people that see objects informed by impressions from a functional perspective. They are often located in operating entities that are exposed to the subtle indicators of environmental change and gain new insights from immediate responses. There is also a need for people who see the surroundings in an analytical way, such as, executives, general managers and planners who can interpret information from a business perspective and adjust short-term action plans according to an overarching plan.

Hence, functional employees and the managers of local operating entities can quickly gain new insights from the responses they take to immediate changes in their task environments. These insights can be used to update the forward-looking analytical reasoning carried out by the planners and executive managers located at headquarters. If this kind of updating is done sequentially with regular

intervals, the central interpretation of the strategic context will become more closely aligned with current developments in the environment (Figure 2).

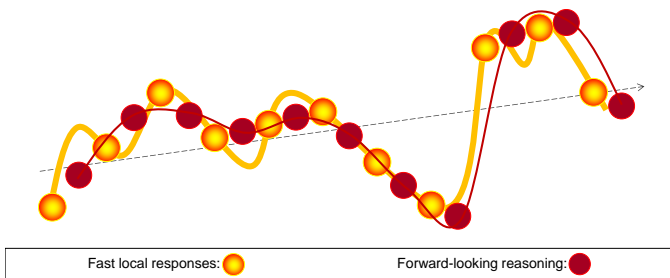


Figure 2. Fast Local Responses can Update Central Strategic Reasoning

Firms that are able to respond effectively to ongoing changes and thereby adapt organizational activities to provide a better fit with the environmental context at any given point over time, will not only generate higher average returns, but will also display a more stable or less risky performance development [30]. That is, organizations with effective strategic response capabilities will display both higher performance and lower performance risk at the same time. This reflects the negatively skewed performance distributions and inverse risk-return relationships observed empirically among firms across all industries [31].

A collection of individuals in an organization with both central analytical planners and decentralized operational actors in local entities constitutes a dynamic system of slow and fast information processing. This resembles the dynamic system of the human brain. Like the brain we are dealing with interplays between doing things (fast and ongoing) and reflecting (slow and with a low-frequency). The perception of the surrounding environment derives from observing responses taken by decentralized actors where the conception of the environment evolves from central forward-looking considerations.

Effective organizational learning under turbulent conditions hinges upon a setting that is conducive to collaborative learning. This is driven by cultural norms, attitudes and expectations that encourage and inspire ongoing discourse in all parts of the firm. It includes discussions around decentralized responsive actions to emerging changes that create new insights in local entities with involved individuals. This knowledge can also be communicated to and exchanged with individuals in other parts of the organization. Hence, it is important to encourage localized discourse as well as to enable connections between different decentralized knowledge communities and central planning entities when trying to deal with complex issues.

V. CULTURAL TRANSFORMATION

The adaptive behavior of an individual depends on interactions between the nervous system, body and the environment. The body interacts constantly with the surroundings and the central nervous system transmits information about these encounters to the brain. New events are observed as they happen and the effects from actions taken

by different parts of the body are noted. So, there is continuous feedback between the nervous system, the body, and the environment. This view of adaptive behavior has been an underpinning of ecological psychology and developments in behavior-based robotics [32]. At the individual level, the environment is made up by physical things in the surroundings including colleagues, peers, and other stakeholders that may react to various incidents. At the social level, communication and information replace the human nervous system, different parts of the organization or society resemble ‘body parts’, and various stakeholders constitute the environment. So, organizations and societies can represent the various elements of the dynamic information system in the human brain that make up the fast-slow interaction.

Collaborative learning requires that individuals can act and interact within a supportive social system and is influenced by cultural values as they influence the way observations are communicated and insights are exchanged. So, models that try to explain human behavior without considering the effects of culture are likely to be unsatisfactory and will almost certainly be incomplete [33]. Culture can be perceived as information that affect individual behaviors thus implying that cultural variation arises from learning processes where information stored in individual brains is exchanged among many individuals within a social system [34]. So, culture is formed through the exchange of information between other individuals in social transmission mechanisms consisting of knowledge, beliefs, attitudes, norms, preferences and skills stored in individual brains.

Different sub-groups co-develop distinct values and norms that lead to distinct behaviors and in turn may compete with the behavioral traits of other sub-groups. This is consistent with evolutionary theory where firms compete on the basis of superior routines that can be partially transferred and reorganized for adaptive purposes [35]. Information becomes a basic inheritance mechanism where the evolutionary process depends on the ability to express and interpret the information effectively [36]. Language is a communication tool that allows explicit knowledge to be stored as common terminologies, definitions, concepts and understood practices that drive a cultural process. The communication and information systems can be interpreted in this light as their particular use drives different corporate cultures that compete to generate evolutionary adaptation.

Variations in culture are passed on among individuals within a sub-group as well as among individuals in other sub-groups in the surrounding society. Human socio-economic development seems based on the gradual accumulation of many successive routine modifications serving to increase effectiveness and efficiency. Hence, innovation does not appear as random mutations but is typically displayed in a multitude of small incremental steps [37]. Successful innovation is conceived as slight modifications of what went before or combining previously separate innovations. The cultural diversification through gradual changes can also arise from individuals that introduce new traits at random, from

migrating individuals, or personal exchanges across external networks. Cultural evolution is a very adaptive mechanism and appears to be a unique human phenomenon.

The ability to engage in collaborative learning is not merely a byproduct of individual learning and social behaviors but is based on distinctly human mental mechanisms. Sharing experiential insights gained from decentralized responses among individuals is culturally driven and constitutes an economical way to deal with turbulence. It creates new knowledge and uncovers viable initiatives that can be applied across the entire organization or society through adaptive replications. The organizations can decide to engage in learning when it can reach cheaper and more accurate solutions and imitate when learning is costly and inaccurate. Hence, combining fast and slow systems where interactions are bound together by cultural artifacts appears both efficient and effective in dealing with unexpected events and open collaborative learning appears superior both in terms of cost and adaptive capability.

VI. COLLABORATIVE LEARNING

Creativity and innovation can be seen as evolving properties of interacting fast and slow processes where cognition is formed through the combined processes of slow reasoning and fast actions. Ideas can arise from both fast and slow processes but judgments as to which ideas are better derive from the slow forward-looking reasoning. Alternative directions are considered through reasoning and their consequences assessed in simulated analysis based on assumptions. When the strategic actions are carried out, the fast decentralized information processing is at play as adaptive responses are taken to accommodate opportunities that contradict initial assumptions. The intuitive sensing of the effects from responsive actions is part of the fast actions processes where the insights can update the slow forward looking system. This forms the dynamic interaction effects between actions induced by the slow system, immediate actions taken in response to emerging external events, and continuous observations of outcomes in the fast system.

However, individual employees and operational managers rarely act on their own but operate as social beings within an organization as they execute the daily transactions in pursuit of a common purpose. These individuals coordinate their actions through horizontal communication links and receive feedback from various stakeholders affected by these activities to make sense of the situation and the evolving surroundings [38]. This ability of individuals in an organization to engage in responsive actions when conditions change is important for responsiveness and adaptation. As noted by Andy Grove [39] “the process of adapting to change starts with the employees, who through their daily work, adjust to the new outside forces”. They face new challenges and deal with them by engaging in innovative responses.

The dynamic interaction between individuals is important to take advantage of the diverse experiences, insights and

knowledge that exist in different parts of the organization. The ability to adapt to new complex situations requires collaborative efforts between many individuals because the amount of information required to solve highly complex and ambiguous problems exceeds the capacity of single individuals. Dealing with ambiguous and uncertain situations requires different types of knowledge that can generate ideas and create new insights from operational experiences [40]. Therefore, collaborative learning is more effective in developing good solutions to highly complex issues.

VII. CREATING A RESPONSIVE DYNAMIC

Decentralization allows exploratory initiatives to be taken locally by operating individuals that may uncover better ways of responding or identify valuable business opportunities. The strategy process with related control systems can be used for forward-looking evaluations of opportunities uncovered from decentralized experiential responses. Using management information systems to monitor organizational outcomes can provide new insights when outcomes deviate from expectations and new action patterns are revealed. Hence, interactive central and decentralized strategy-making processes can improve the general understanding of the evolving environment and uncover viable solutions.

In the fast organizational processes at the operational level, employees and local managers respond to ongoing changes in the surrounding business environment. They engage in *experiential learning* as they gain impressions from various stakeholders affected by the responsive actions and learn what may work under the new circumstances. They essentially do things to accommodate the daily routines and use insights from responsive actions to form anticipations about what works. In the slow organizational process at the strategic level, top managers and people around them engage in *forward-looking reasoning* to determine a proper strategic direction adopting a rational analytical approach. They use available information on trends on demand, competition, technology, regulation, resources, competencies, etc., to create and assess alternative paths. The crucial question here is what information top management uses to support the forward-looking analyses. The slow-fast processing rationale suggests that corporate executives should consider the experiential insights generated by employees and lower-level managers.

There is a need for high-frequency processes of monitoring and learning to bind the slow-fast processing systems together. That is, social systems like organizations and societies have to find a balance between periodic management reporting, sequences of interactive controls, and informal communication. This constitutes a combination of approaches tailored to specific environmental needs that can become a winning formula for sustainable advantage.

VIII. DISCUSSION AND CONCLUSION

Individuals in the organization and other close stakeholders like customers, suppliers and partners, observe environmental

changes and gain new insights from the responsive actions taken by the firm. When this information is considered in the central planning deliberations the diverse insights can help interpret the emerging conditions through rational analysis. A dynamic interactive system between slow and fast processing creates a balance between ongoing identification of contextual situations and collective forward-looking reasoning that enhances the ability to handle unexpected changes. Social systems that embrace a culture of collaborative learning are better at dealing with unprecedented complex situations and such culturally driven evolution has a durable adaptive capacity.

The logic behind the superiority of interacting fast and slow information processing is supported by individual motivation, interacting dynamics, collaborative learning and cultural network arguments. Autonomy and individual involvement generate innovative responses to changing conditions. The responsive actions taken by individuals generate experience with updated insights that can inform central forward-looking reasoning about environmental developments. Collaborative efforts among individuals can deal more effectively with the challenges in turbulent environments.

The environmental context consists of both physical and cultural surroundings but is also comprised by situational settings. The physical and cultural surroundings are independent of the observer whereas situations are determined by the person identifying the elements of relevance for immediate action. The same physical surrounding may contain many different situations but they can only be identified by individuals in the fast system where the observations are interpreted against their specific contexts. Since people identify situations through ongoing interactions with the context, individuals dominated by the slow system create a schizophrenic mindset evolving around their own concepts of the surroundings. In the same way cultures dominated by slow central processes can create schizophrenic-like social contexts where individual decision-makers only focus on their own conceptualizations of the environment.

We need observance and fast responses among individuals in lower-level operational functions as well as evaluating analytics close to senior high-level decision-makers. One should not go without the other. Here the essential challenge is to enable this dynamic by structuring things appropriately allowing for both fast and slow information processing with appropriate communication and information systems to facilitate the needed interaction. Hence, leadership assumes a different role in the fast-slow optic as being one of enabling effective interactive processes establishing organizational and societal settings with cultures conducive to human interaction and collaborative learning. This means that **a prime executive responsibility is to set up appropriate decision structures, management information systems, and control processes based on durable values, behavioral guidelines and coherent incentive structures.**

Decision structures and related management information systems are important features that characterize and frame an organization's strategy making process. Centralization of decision rights confines decision making to the top executives while dispersion of power allows managers at lower hierarchical levels to take responsive actions within their areas of responsibility. In turbulent environments organizations must deal with an increasing amount of information, complex interactions, and a multiplicity of individual knowledge-based competencies [41]. Here decentralization may increase responsiveness but it is not sufficient for sustainable performance since we also need the consequential assessments from the slow analytical reasoning at the center. The dynamic between interacting fast and slow processes explains why this must be the case. Because this interactive dynamic ensures that environmental changes are observed and responded to in the fast information process where individuals interact with various stakeholders as they carry out their daily duties. Collaborative learning among these individuals facilitates better solutions to complex environmental challenges and open communication makes sure that insights and solutions are forwarded to the slow system of forward-looking considerations.

Hence, the fast-slow systems thinking from cognitive science provides a foundation for understanding the required human processes in social contexts of organizations and societies as important underpinnings of needed dynamic capabilities. This raises relevant questions about the role of senior decision-makers supporting interactive decision-making processes where social looping effects across sub-groups and communities can enhance cultures that facilitate collaborative learning. The ability to engage in decentralized responses may be an economical way to experiment in uncertain environments as a form of small low-cost probes searching for new solutions to complex situations. The interaction with the slow analytical information process in turn provides the means to evaluate the relative effectiveness of the various probes, select those that seem to work, and convert them into larger organizational or societal initiatives where coordinated actions increase the stakes for success. In short, the interaction between fast and slow information processing in organizations and society constitutes an effective way to respond and adapt to the ongoing changes in highly complex environments that require new innovative solutions.

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