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# Supporting Complex Decision Making – The Role of Enterprise Technologies

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## Abstract

The current economic crisis has been widely viewed as yet further proof of the inadequacy of managerial Decision Support Systems. In spite of a half century of research into business decision making many still question whether information technology has actually improved how management addresses their business challenges. New technologies, rather than facilitate innovative approaches to managerial decision making have more often than not simply reinforced traditional managerial orthodoxies. This paper explores this relationship, and proposes the concept of corporate ecology as a means of enlarging managerial choices while focusing technology initiatives where they can provide measure value to organizations.

**Keywords:** Managerial decision-making, decision support systems, enterprise technologies, corporate ecology

## Introduction

Palladium CEO David Friend [1], like many industry observers, has recently underlined the responsibility of poor decision making in the current economic crisis. This critique is nothing new, for the perceived failures of managerial decision making, as well as the support of the underlying organizational processes, have been under close study for most of the last fifty years. If managers are made and broken by the quality of their decisions, why haven't entreprise technologiess substantially improved the process?

Enterprise technologies enrich the quality of managerial decision making to the extent that they foster a significant change in how management views their business challenges. In our opinion, the current introduction of peer based and social networking applications, like that of functional and process centric applications in the past, will have little impact on how managers take decisions. The following paper introduces the metaphor of *corporate ecology* to help organizations leverage technology to improve the decision making process. The resulting framework encourages managers to survey their organizations as territories that have been staked out from particular experiences and then to design contextual strategies for sustainable future growth.

In the contribution we begin by examining historical development of research on decision-making and Decision Support Systems (DSS). Building upon this analysis we will then focus on the concept of bounded awareness, and specifically on the role that enterprise technologies have played in shaping managerial expectations and behavior. We will introduce the concept of corporate ecology as an operational framework to capture the importance of context in shaping pertinent management options. The paper will conclude with a discussion of how these considerations are being addressed as we apply this framework in our research for the Leading Edge Forum (LEF)

## Managerial decision making

According to Keen [2] the roots of contemporary research on organizational decision making can be traced back to the early 1960s to the conceptual work at the Carnegie Institute of Technology while those of Decision Support Systems can be found in the projects on interactive computer systems undertaken by the Massachusetts Institute of Technology .

Hackathorn and Keen [3] have suggested that subsequent research has focused on three types of managerial decision making. Independent (or "high noon") decision making occurs when an individual alone assumes responsibility for gathering the necessary information and making decisions. Sequential interdependent decision making involves a workflow in which an individual makes a decision to address part of a larger problem, and then passes it on to another. Finally, the authors define pooled interdependent decision making in which all the participants work together throughout the decision making process.

Kahnemann [4] noted, when accepting the Nobel prize for economics, that the distinction between intuition and reasoning has been a topic of constant discussion and debate over the last three decades (see Sloman [5]; Stanovich [6]; Stanovich & West [7]). A general consensus has emerged of the general characteristics of these two concepts which Stanovich and West have labeled System 1 and System 2. The managerial skills generally associated with intuition (System 1) are automation, associativity, and perception. The mental characteristics associated with reasoning (System 2) tend to focus on deliberation, replicability, and control.

Dawes [8], based on his case study of the graduate application process, was one of the first to demonstrate that linear models produce predictions that are superior to those of experts across an impressive array of domains. Bazeman and Chugh [9] have suggested that System 2 thinking can be leveraged to reduce System 1 errors by explicitly addressing managerial attempts to simplify organizational complexity.

Rather than trying to modify a decision maker's thinking from System 1 to System 2, recent research on behavioral economics has suggested that changing the organizational environment to facilitate intuitive thinking (System 1) can improve the process. These recommendations provide the principal focus of Thaler and Sunstein's [10] propositions in their work *Nudge*.

This theme of enhancing the managerial view of the organizational environment has been a principal tenet of Decision Support Systems. According to Klein and Methlie [11] the original DSS papers were published by Ph.D. students or professors in business schools who had access to the first time-sharing computer systems: Project MAC at the Sloan School, the Dartmouth Time Sharing Systems at the Tuck School' and in France at HEC.

Doctoral research by Scott Morton [12] demonstrated that managers benefited from using a computer-based management decision system. Keen [12] later defined a decision support as "a problem-solving aid that either lowers the cost of carrying out an existing mode of analysis or encourages the individual to increase his or her level of reaction from routine to adaptive or adaptive to fundamental."

Sol [13] has suggested that the definition and scope of DSS has in fact evolved in response to both the evolution of business challenges over the years. In the 1970s DSS was described as "a computer based system to aid decision making". In the late 1970s the DSS movement started focusing on "interactive computer-based systems which help decision-makers utilize data bases and models to solve ill-structured problems". In the 1980s the focus on DSS shifted to providing systems "using suitable and available technology to improve effectiveness of managerial and professional activities".

By the 1990's DSS faced a new challenge in the design of intelligent workstations. Today the intention and the scope of Decision Support Systems are commonly classified using Power's five tiered typology [14] [15]: communications-driven, data-driven, document driven, knowledge-driven and model-driven decision support systems. Decision Support Systems seem to mirror the objectives of the larger information architectures around them.

## Bounded Awareness

The implementation of Decision Support Systems are to a large degree based on the assumption that managers are both capable and willing to use information to make rational decisions based on best case scenarios. The validity of this basic assumption has long been contested by a number of sociologists who argue that human perception is inherently bound by organizational context. Herbert Simon [16], among others, has argued that in fact, "human rationality is very limited, very much bounded by the situation and by human computational powers". Schkade and Kahneman [17] categorized human proclivity to willingly make judgments based on imperfect information as a "focusing illusion". Chugh and Bazerman [18] have suggested that this bounded awareness is a phenomenon in which individuals do not "see" accessible and perceivable information during the decision-making process. They suggest that this "focusing failure" results from a discrepancy between the information needed for a good decision and the information commonly used in managerial decision making. .

Enterprise technologies, rather than enhancing a manager's ability to locate, leverage, and share critical information, have often hampered managerial insight by imposing a number of stringent boundaries on the decision-making process. One such boundary can found in the successive generations of enterprise technologies that have privileged certain types of information over others in describing organizational realities. Enterprise technologies can be best understood as the implementation of information technologies to capture the information necessary to achieve an organization's operational goals. These technologies define the role of information technology inside the organization, the supports used to capture and process the targeted information, and the transactional processes needed to implement new technologies in response to changing organizational needs.

Four distinct generations of enterprise technologies have been deployed in business over the last thirty years to improve management's understanding of the organization and its market [19]. Functional architectures have provided management with conceptual models describing enterprise roles, interactions and expected results based on industry norms. Process- centric applications enlarge the notion of best practice to propose standard methodologies for shaping organizations across functions and divisional units to optimize the flow of information, goods, and investments. Extended Enterprise architectures are attempts to capture the exchanges of loosely coupled networks of firms to deliver a cohesive set of products and services offerings to a given market. Finally, social media

based applications use Internet- and mobile-based tools to capture unstructured data through and user interaction to focus on opinions, insights, experiences, and perspectives.

Each of these enterprise technologies has introduced a specific set of technical and organizational considerations that challenge how managers do and should take decisions. To begin with, their design blurs to various degrees the distinctions that separate the organization from its eco-system, not to mention that between employees and customers.   These applications encourage collaboration, but provide few clear rules of engagement for influencing effectiive managerial participation in the business. The key performance indicators produced by these applications gauge the weight of culture and informal organization differently in explaining why certain organizations outperform others. Finally, their use tests the foundations of managerialism:  What role should command and control play in organizations held together essentially by perceptions of common interest?

A second perceptual boundary can be found in the models that decision makers have used over the years to frame organizational realities. Management as a science, as F. Taylor demonstrated, assumes that business is essentially about "simple" challenges in which the problems are well understood, and for each problem there is "one best way" to move the organization forward. The role of information technology has been traditionally to structure organizational activities into standard processes, and to record progress towards the mean. A customers, organizations, and markets mature, the nature of the problems managers face has evolved substantially. As management has turned its attention to new products, services and markets, managers face the less empirical, less linear challenges of optimizing organizational resources. The role of information technology in supporting the decision making process has shifted accordingly to address supply chain issues around enriching physical, financial and/or human resources.

Stacey [20] and Snowdon [21], among others, have argued managers are increasingly confronted with complex challenges that defy the very principles of scientific management. They argue that the nature of the challenges   differ from those addressed previously: even if there exists a broad consensus concerning today's business challenges:  launching new products, improving market share, enhancing organization productivity, the "best"  answers to these challenges have eluded the experts.   In complex markets, traditional IT architectures seem unable to effectively support managerial decision making.  In fact, systems prescribing best practices of process control, cost cutting, standardization often create more problems than they solve. These situations seem to require complex adaptive systems that focus managerial attention on the degree of certainty and level  of  agreement concerning  each issue.

For many managers, the very idea of straying from the beaten track of global best practices seems both counterproductive and counter intuitive. After all, if the introduction of process centric support systems has worked in the past, why shouldn't it work in the future? Yet, if many managers introduce technologies that simply reinforce existing managerial orthodoxies, the meager results are often gained at the expense of personal engagement, creating a vicious circle of bottlenecks, disengagement, and disillusionment.

A third conceptual boundary can be found in the very categorizations that decision makers perpetuate to deal with organizational challenges. Commonly referred to as the company culture, employees and organizations are greatly influenced by previous experience.   Proponents of social network analysis suggest several reasons behind this organizational reality.  To begin with, in business everything is connected: managers and employees alike are influenced by the successes and failures of their colleagues. Although managers deploy methods, technology and directives to enhance authority, knowledge, and energy, the results depend less on each initiative than on the relationships that characterize each organization. Company culture is often judged as an obstacle to organizational change, often rightly so when initiatives contest the nature of the existing relationships.

Potentially, the practice of management offers a much wider range of possibilities than traditional management theory suggests. For the purposes of our own research, we have defined management as a series of decisions taken to enhance the impact of organizational knowledge, influence and engagement [22]. Knowledge can be enhanced either for the individual or for the organization; it can be seen to either codified or embedded. Influence can similarly be concentrated or diffuse, strategic or opportunistic. Engagement can be either be fostered extrinsically or intrinsically, instrumentalized or based on ethical considerations. Why do decision support systems always seem to favor only one set of remedies?

If a manager's job is to add value to his organization, which paths lay open to move the organization forward?  Choosing a pertinent path requires understanding how company culture has impacted organizational performance in the past. Managers need to explore how the interplay between managerial choices, technological initiatives and personal engagement has marked their organization. Organizations need to look past traditional decision support systems to the types of business challenges

that their managers are facing, and to implement technological solutions that directly address the problems at hand. Finally, the solutions, rather than reinforcing the current managerial paradigms, need to be sufficiently dissonant to permit the organization to grow. If creativity, engagement and energy are the cornerstones of innovation, the very the foundations of managerial decision making need to be periodically reset.

## The Framework of Corporate Ecology

Behind the concept of Corporate ecology lies a three dimensional framework designed to help managers refocus attention on the contextual factors that explain the success and failure of decision support systems in enhancing organizational performance. The accompanying toolbox can be used both as a descriptive model for understanding how organizational experience has bounded current performance and as a prescriptive framework for successfully leveraging information technologies in the future. Let's first explore the context and the dimensions of the model, then explore why similar information architectures produce quite different results, and finally examine how this methodology can improve managerial decision making.

The potential of organizational performance is determined as much by the past as by the future. Organizational performance can be visualized as two concentric circles:  one representing where the organization is today given current constraints and the other defining where the organization could be if its resources were used to their full potential. Management involves taking decisions of how to best close the gap between the two.



*Corporate Ecology: moving "forward" to fulfilling organizational potential*

Rather than reducing business decision making to an organizational chart of well defined functions or as a set of processes that need to be optimized, the objective here is to deepen management's understanding of how experience, context, and vision have molded their territories over time.

In the framework of corporate ecology, three dimensions provide potential paths between where organizations are and where they could be. In understanding how the context, experience and

vision of each organization have mutually shaped the reality of these roadmaps, the framework encourages managers to develop a realistic view of the expanse and the complexity of the organization in which they work:

- The application of management principles draws attention to which practices have produced measurable results in the past.
- The implementation of technology projects helps capture, examine, and automate common administrative tasks.
- Interactions with people – customers, employees, colleagues and shareholders – provide the passion and innovation needed to give meaning to work.

As important as each of the dimensions may be, managers that focus too narrowly on any one to the exclusion of the others draws managers inevitably off the track of success. The introduction of new decision support systems in an organization inevitably influences, and is influenced by existing management practices and levels of personal engagement.   As might be expected, the implementation of global best practices that neglect the organization's past experience are likely either to be ignored or worse produce negative results.



*Diminishing returns: when doing more produces less*

More surprisingly, technological choices that simply reinforce existing business practices or cultural norms are more likely to rigidify the existing boundaries than stimulate profitable growth. Economists have called this phenomenon the law of diminishing returns:  as investments in any one area increases productivity growth proportionality decreases.  Rather than provide a road forward to help an organization grow, new technologies can somethimes hinder productivity through a vicious circle of bottlenecks, disengagement, and disillusionment.

When we speak of improving managerial decision making, we are focusing on the manager's role in designing and implementing targeted strategies to enrich organizational performance.

Although there is panoply of potential options available to foster growth, very few will make sense in the context of a particular organization. Understanding the distinctive contours of each territory will be fundamental in charting a road forward in today's economic climate of depleting resources and diminishing returns.

For many managers, the idea of not doing more of the same can seem both counterproductive and counter intuitive. That said, in the right conditions the introduction of new technologies can provide the dissonance necessary to encourage employees and their managers to reach for a new equilibrium closer to the organization's potential.

Although corporate ecology can be compared in many ways to environmental science, its focus on managerial choice justifies its use in business. The goal of corporate ecology is not to take people out of the equation through the progressive adoption of technology and management, but to use information technology to anchor the human resource in the heart of the enterprise. Decision making is inherently a human exercise: the value of individual input is critical in difficult economic conditions when time tested recipes no longer produce the desired results. People purchase technology, people input the data, and people interpret the results. Since human interaction also shapes stakeholder behavior, improving the depth and breadth of managerial perception can go a long way in reinforcing the value proposition of Decision Support Systems.

*How does corporate ecology differ from traditional management approaches?*

Before turning our attention to how this framework can be used to guide future managerial choices, it is important to explain how "corporate ecology" differs concretely from existing management frameworks. Our research attempt to goes beyond simple catalogue of managerial practices or proposing a normative model of future technological options, we have attempted to provide the contours of a cohesive roadmap to improve managerial decision making. Four guiding principles: singularity, path dependency, bandwidth and the value of dissonance set corporate ecology apart from traditional and "scientific" approaches to management.

The principle of singularity suggests that successful business practice is a lot "messier" than the principles of best practices and "one best way" would suggest. Management, especially in times of economic difficulty, is primarily a question of focusing on what is essential in moving an organization forward. Corporate ecology proposes that it is essential to take a hard look at how your employees, your sponsors, and your customers behave in reality rather than playing lip service to idealised models of how business should be run. In reality, business is about dealing with problems that defy simple answers, accepting that work is a lot more complex than we would like it to be, and that neither our customers nor our colleagues are wholly rational decision makers. In such contexts there is no universal one best way of moving forward, just better ways than others to foster pertinent decision making.

As managers realize each time they are faced with implementing global best practices, businesses can rarely start from scratch. Their history, culture and experience opens some doors while closing others. Technology options may be sound in theory, but their impact will be inevitably influenced by the dominant management practices. Social scientists suggest that in an increasingly interconnected economy the growth of teams, organizations and markets is inherently dependent on initial conditions. Corporate ecology takes on board this principle of "path dependency" to explain why even the best designed technology projects can go wrong.

The principle of "bandwidth" suggests that managerial discretion is much broader that most managers think. This gap between conceptual models and actual practice opens up a larger pool of initiatives than theories of "global best practice" suggest. A wide variety of value propositions can be formulated around new management practices, technology implementations or personal engagement. Mangers need to recognize that global best practices aren't the only rational option, let alone the best option available. The choices that make sense will fit more easily into the organizational context than into a consultant's handbook.

Finally, the principle of dissonance suggests that management solutions are rarely found in models. They are more likely to emerge from inquiry into why managers have problems with applying their principles consistently. If controlling risk and deviance were the only goals of management, the current economic crisis would be yet another proof that managers are doing a very poor job. Managerial innovation and risk go together: innovation is all about appreciating that improving performance requires accounting for the risk of moving forward. On the one hand, forcing employees to "toe the line" can be both illusive and useless in adding value to the organization. On the other hand, behavior that deviates from the norm can be a real source of innovation if we understand how it reflects individual perceptions of organizational practice and experience. Experimentation involving new approaches to management decision making is inherently risky, yet fundamental in helping an organization move from where it is to where it could be if it used all available resources to their full potential.

*Putting the framework into practice*

In dealing effectively with the organizational issues that challenge the business today, we are suggesting that management would be wise to refocus its attention on the larger implications of how Decision Support Systems have influenced and are influenced by persistent managerial orthodoxies.

In our current research project on "Rethinking Management and Employee Engagement" at the Leading Edge Forum [23], we have proposed a mindset around the concept of corporate ecology to focus managerial attention on a roadmap for growing their business towards their organization's full potential.   As part of our project team's research, we are currently producing a workbook that synthesizes the operational activities and tasks that can help organizations put our recommendations into practice. The implementation of the framework involves three processes: 1) surveying organizational resources, 2) projecting the growth of the eco-system and 3) personalizing the return on investment for the organizational stakeholders. Let us quickly look at each in terms of their major themes, objectives, and likely outcomes.

LEF's project team is putting together a number of simulation games, visioning exercises, and group worksheets to explore managerial perceptions of the nature of the gap between current organizational realities and organizational potential. These activities are designed to identify the coherence of existing technological architecture, the degree of organizational fitness of existing Decision Support Systems, as well as the managerial perceptions of the strengths and weaknesses of the current deployments.  The desired outputs of this process are a general consensus around the nature of the contextual challenges in leveraging information technologies more effectively.

The results can then be mapped back to the three dimensional model of corporate ecology to uncover the realistic paths for improving the decision making process. .A second set of activities involves projecting future scenarios for exploiting organizational data in enhancing organizational performance.  Project exercises here include focus sessions and group work with subject experts, peers and/or customers depending on the nature of the challenges to be addressed. The overriding goal is to provide an operational roadmap that recognizes the unique position of the organization and the actionable steps that will enrich performance. Deliverables here include the specific knowledge, actions, and metrics needed to deal successfully with the targeted challenges.

A  third  set  of  activities  involves contextualizing  the  return  on  investment  for

organizational stakeholders. Here the group's work focuses on encouraging managers to appropriate the roadmap in the form of personal visions that reveal individual action points, expectations, metrics and payback. The implementation activities here are monitored  and  then  mapped  back  to  the organizational  challenges  to  help  management visualize the impact of the ongoing projects on organizational performance.  The goal here is to manage expectations and to produce a structure of testimony and feedback that can demonstrate the personal value of each investment.

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