

Agility Research: History and Summary

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Executive Summary

Introduction



Even though there has been research on the topic of agility, these studies are not unified regarding their conceptualizations of agility and/or tend to adopt fairly limited views of agility dimensionality. Here, we organize a review of existing definitions and conceptual models of agility, and advance a comprehensive model on an open systems perspective - The Agile Model®. This model offers both a theoretical and applied framework for understanding, researching and applying individual, team and organizational agility.

Reliability and Validity of the Agile Model® as Measured by the Leadership Agility Profile™:

The LAP is based on **The Agile Model®** which was derived from multidisciplinary research from the public and private sectors in the areas of Total Quality Management (e.g., Malcolm Baldrige National Quality Award), Manufacturing Agility (e.g., Agility Forum), Confidence (e.g., Rosebeth Moss Kanter), Employee Engagement (e.g., The Gallup Organization, Kennexa, etc.), Innovation (e.g., Center for Creative Leadership), and Predictive Analytics (e.g., Thomas Davenport). Academic research from Dr. Lee Dyer (Cornell), Dr. Don Sull (London Business School), Dr. Ed Lawler (USC) and Dr. Yves Doz (INSEAD) provided many of the theoretical underpinnings for the LAP.

Independent research by organizational psychologists at an organizational research firm was conducted on the Agile Model's psychometric properties and provided evidence of the reliability and validity of the LAP. When factor analyzed, the five drivers of the LAP (Anticipate Change, Generate Confidence, Initiate Action, Liberate Thinking and Evaluate Results) are distinct factors and highly reliable.

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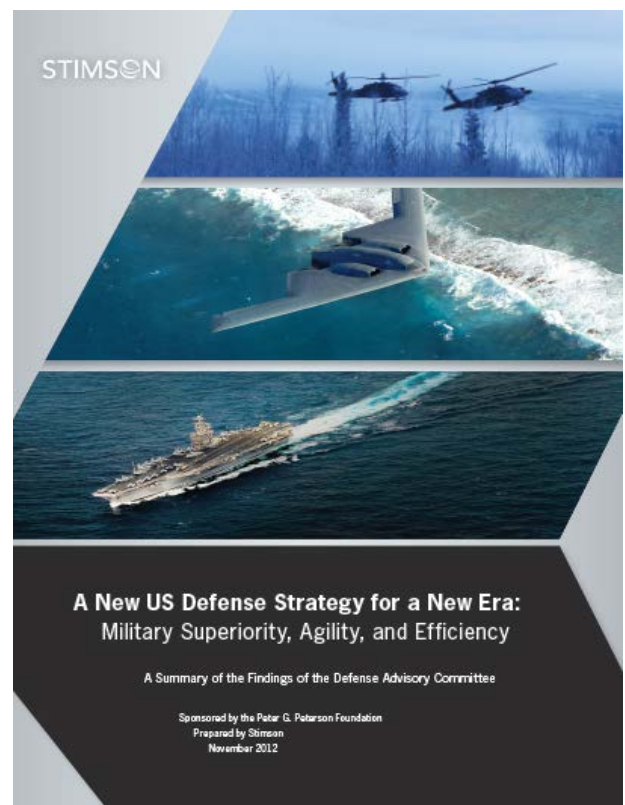
Also, when regressing the outcome-related items on A-G-I-L-E factors, the factors account for 60% of the variance. The LAP has a reliable scale of five distinct factors (each with a Coefficient Alpha above .90 where .75 is the minimum required to demonstrate reliability). The research also indicated that the outcome related items had a Coefficient Alpha of .819.

Agility is the dynamic capability to anticipate and respond to challenges and opportunities with focused, fast and flexible people, processes and technology. The successful leader, team or organization will evolve, not through random mutation, but through purposeful and agile strategies that influence and respond effectively to unpredictable and shifting marketplace demands and world events.

Strategic agility is not about perfect prediction of the future. Instead, it is about being prepared to exploit change, and making informed decisions as to the best moves and countermoves for the business. It is about an organization's ability to move all employees up the strategic agility spectrum from "I'm totally oblivious to the potential changes that might impact our company" to "I see change coming and am prepared and already doing something about it."

So, Why Agility?

The global business environment has shifted into an era where being an agile company has become a survival statement and where best practices must yield to next practices as we discover how to effectively adapt and thrive in this real-time, fast-paced and ever-changing world. Market volatility is a tremendous source of opportunity for companies that have developed the capabilities to not only manage risk but also respond to it more effectively than their competitors. In addition, the public sector is focusing more on agility as a means to revamp strategy and recognize budgetary savings (Stimson research proposal - New DOD Strategy based on Strategic Agility - 2012).



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In their 2006 book, *Built to Change*, organizational effectiveness experts Edward Lawler and Christopher Worley found that between 1973 and 1983, an average of 35 percent of the top 20 companies on the Fortune 1,000 were new to the list. The number rose to 45 percent in the next decade, then soared to 60 percent the decade after that. And it's likely to top 70 percent in the decade that ends in 2013. Few companies have built agility into their DNA to sustain success over time.

Organizational agility is a firm's ability to adapt continuously to a complex, turbulent and uncertain environment (Goldman, Nagel, & Preiss, 1995; Jorroff, Porter, Feinberg, & Kukla, 2003; Shafer, 1997). Many firms now consider organizational agility to be essential for their survival and competitiveness (Lin, Chiu, & Chu, 2006; Sharifi & Zhang, 1999), because it enables them to develop a set of distinctive capacities giving the opportunity to the firm to react in the face of rapid and continuous change and to seize new opportunities.

The managerial enthusiasm which has greeted organizational agility nevertheless comes up against a relatively fragmented and limited literature. but several studies opt to examine specific facets of it. Kassim and Zain (2004) thus analyze the agility of information systems and technologies whereas Lin and his colleagues (2006) study the agile supply chain. Other researchers such as Dyer and Shafer (1999) or Breu, Hemingway, Strathern and Bridger (2001) explore the agility of human resources. When research is devoted to the global construct of organizational agility, it is rarely accompanied by suggestions as to how the concept can be operationalized or by measurement tools (Gunasekaran, 1999; Sharifi, Barclay, Colqhoun, & Dann, 2001; Yusuf, Sarhadi, & Gunasekaran, 1999).

Agility Background and History

The concept of organizational agility was identified by four researchers at the University of Lehigh (Goldman, Preiss, Nagel, & Dove, 1991) who had been requested by the American Congress to write a circumstantial report on the strategy of industrial firms in the 21st century. This report determined that the current system of mass production was not sufficient to ensure incremental improvement given the evolution of the competition, especially in Asia, which had developed a high degree of flexibility. The report concluded that a new system of production must be invented, one that would be based on organizational agility, in order to meet the needs generated by these new factors of competitiveness.

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Shortly after the report, the AMEF (Agile Manufacturing Enterprise Forum) was created to encourage and spread this viewpoint throughout American firms. In practice, the biggest American firms, especially in the IT and telephony sectors, had adopted the concept of agility in the mid-1990s. Thus, in the early 2000s, Microsoft portrayed itself widely in its advertising slogan as an "agile business", directing its whole discourse towards adopting the agile model, both for the company and for its clients. Companies such as IBM and Google also relied on this model to increase their competitiveness (Dyer & Shafer, 1999) and several consulting firms recommended solutions which would improve their clients' agility, particularly in the information systems sector. Although large industrial and service groups often use the terms "agile" or "agility" in their communication, there is rarely any consensus as to what the term actually means in concrete terms (Sherehiy, et al., 2007). Research is rarely dedicated to developing the whole concept of organizational agility, and when this does occur, such efforts are rather ambiguous when it comes to defining the concept and its components (Shafer, 1997; Sherehiy, et al., 2007); this lack of precision further restricts the potential for operationalization.

Researchers and practitioners from diverse disciplines approach agility from a variety of perspectives. For example, researchers in the manufacturing field focus on mass customization and postponement strategies, which allow more space to respond to demand changes in a flexible way (Goldsby and Stank 2000; van Hoek et al. 2001). Scholars in the field of information systems (IS) promote information technologies as platforms that foster agility by helping achieve time reductions and quality enhancements in product design and development (Frayret et al. 2001), and by facilitating communication necessary to coordinate work activities (Sharp et al. 1999). Scholars in knowledge management contend that knowledge management practices can enable agility (Dove 2005; Holsapple and Jones 2005) by providing greater or faster awareness of changes.

Overall, what agility is and what factors comprise agility are still points of variation among academic researchers. Depending on one's perspective and discipline, terms such as agility, resilience, nimbleness, flexibility, responsiveness, and adaptability are not treated uniformly. The same term has different meanings in different perspectives, and different terms sometimes have similar meanings. These notions of agility, resilience, nimbleness, flexibility, responsiveness, and adaptability are tangled in the literature. The lack of clarity about the nature of each term, as well as how they are related, inhibits progress in understanding

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conditions needed to achieve agility. Therefore, one objective of this research review is to share a comprehensive model of agility and its components.

The creation of The AGILE Model® puts us in a position to better understand the nature of agile individuals, teams and organizations. Some scholars conceptualize agile organizations from the perspective of organizational design, attempting to build up a nomological network of the theoretical relationships among agility, flexibility, adaptation, and responsiveness (Alberts and Hayes 2003; Sharifi and Zhang 2001; Yusuf et al. 1999). Alberts and Hayes (2003) describe the notion of an edge organization, which is characterized by decentralization, empowerment, shared awareness, and freely flowing knowledge required to push power for informed decision making and competent actions to the "edges" of the organization, where they interact directly with their environments and other players in the corresponding field. They conceive of agility as the key attribute of edge organization and argue that agile organizations are the result of an organizational structure, command and control approach, concepts of operation, supporting system, and personnel that have a synergistic mix of the "right" characteristics.

Extending the work of Alberts and Hayes (2003), Gateau et al. (2007) compare the performance of an edge organization with those of five other organizational forms in terms of time, cost, coordination, product risk, and so on. Their empirical results show that the edge organization demonstrates the greatest speed and lowest cost of all forms studied. However, the results also show that the edge organization experiences considerable rework and coordination difficulties, and exhibits a higher risk level than all other forms. Although their results make a case that the edge form of organization is advantageous in terms of productivity (speed and cost related doing work), it does not address the notion of organizational agility (i.e., an organization's alertness and response capability). The authors conclude that additional research is needed to identify parameters that enable organizations to not only operate productively (quickly and inexpensively), but also in an agile manner (e.g., with reduced coordination difficulties and risk, in the face of environmental change).

Work design researchers have studied agility based on the knowledge chain theory, (Holsapple and Singh 2001), where the concept of agility is quite distinct from the notion of productivity. Agility is very much concerned with alertness to changes (environmental and internal) and the capability to use resources in responding to changes in a timely and flexible manner. Productivity does not necessarily yield

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agility; conversely, agility does not necessarily imply productivity. Indeed, there may even be tradeoffs between the two in some situations.

A Review of Agility Theory: Definitional Issues

Agility, as a business concept, was coined in a manufacturing context - particularly in relation to flexible manufacturing systems (Christopher and Towill 2002). Later, the idea of manufacturing flexibility was extended into a wider business context (Nagel and Dove 1991), and the concept of agility as an organizational trait was born.

Many authors define organizational agility generally as the aptitude of an organization to adapt rapidly to environmental changes (Breu, et al., 2001; Gunasekaran, 1999; Kassim & Zain, 2004; Yusuf, et al., 1999). Above all, it corresponds to the capability of an organization to cope efficiently with changing market conditions and a chaotic environment (Barrand, 2006; Joroff, et al., 2003). According to Goldman and colleagues (1995: 8), it is a deliberate response which enables the firm to thrive and prosper in a competitive environment whose market opportunities are constantly changing in unpredictable ways.

When we look at the inherent capabilities of agility, this appears in the first place to be the ability to react quickly and efficiently to environmental changes (technological developments, customer expectations, or competitors' strategies, for example). Several authors also highlight the proactive side of agility, inasmuch as it represents the aptitude to exploit change as an opportunity (Dove, 2001; Doz & Kosonen, 2007; Jamrog, McCann, Lee, Morrison, Selsky, & Vickers, 2006; Kidd, 1994; Sharifi & Zhang, 1999). Indeed, it is a question of anticipating and seizing on new opportunities, or instigating "breakthroughs" by innovation (Breu, et al., 2001; Dyer & Shafer, 2003; Yusuf, et al., 1999). "Thus the concept of the agile organization came to be the description of an organizational model which enabled not only improved reaction time (in the sequence "observation + decision"), but also flexibility. Several authors note the importance of synergy, resulting from internal and external cooperation, in the development of organizational agility (Goldman, et al., 1991, 1995; Sharp, Irani, & Desai, 1999; Sanchez & Nagi, 2001).

Agile capabilities are essential strategic abilities which enable the firm to respond to change (Sharifi & Zhang, 1999) and establish its competitive bases (Yusuf, et al., 1999). But various terms are used to name these capabilities: responsiveness, anticipation, adaptation or reconfiguration, efficiency, flexibility, quickness,

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innovation, knowledge management, learning (Amos, 1998; Dove, 2001; Kidd, 1994; Sharifi & Zhang, 1999; Sharifi, et al., 2001). Comparing these works leads us to consider, along with Shafer (1997), that these aptitudes can be synthesized into three key and interrelated organizational capabilities. The first capability is the organization's aptitude to mobilize a rapid response to change. This is based on reactive flexibility and the optimization of existing resources (Charbonnier-Voirin, 2010). The second organizational capability is the aptitude to read the market. This enables the firm to explore and detect potential or emerging developments through its watch capabilities (Sanchez & Nagi, 2001). It also denotes the organization's capacity to transform available information into projects which create value thanks to sufficient capacity for improvisation and innovation (Shafer, 1997; Shafer, et al., 2001; Sharifi & Zhang, 1999). Finally, the third capability is the aptitude to integrate organizational learning. This capacity for efficient management and the implementation of knowledge (Dove, 2001) corresponds in particular to the ability to adjust human capabilities and qualitatively align them with the organization's strategic perspectives through the exchanging of experience, knowledge transfer and record time skills development (Shafer, 1997).

In order to contribute to the development of organizational agility, the agile enterprise's infrastructure is made up of reconfigurable levers conceived to ensure the success of agile practices. There is a relative consensus about these reconfigurable levers, which can be deployed when circumstances change: these are (1) the firm's structure and organization, (2) its processes, (3) technology, including information technology and (4) human resources (Amos, 2000; Dyer & Shafer, 1999, 2003; Shafer, 1997; Sharifi & Zhang, 1999; Sharifi, et al., 2001). Some of these authors also note that it is important for the agile firm to rely on stable levers which ensure the organization's continuity and identity in order to generate the necessary cohesion for transformations to take place: a shared vision and values as well as common performance metrics (Amos, 2000; Shafer, 1997).

The levers support the development, implementation and adjustment of those agile practices (also called agile attributes) which represent the most operational level of organizational agility. The literature displays a wide lack of consensus concerning these practices. Indeed, some authors like Sharifi and Zhang (1999) do no more than mention their existence. Others, like Yusuf and colleagues (1999), propose lists of attributes which nevertheless remain general (accessibility of information, introduction of new products, rapid formation of partnerships, continuous improvement, short conception/production deadlines, decentralized

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decision making, etc). Lin and colleagues (2006) note the vague and ambiguous nature of such attributes. Some authors, on the other hand, specify practices related to only one domain, for example those inherent to technologies and information systems (Kassim & Zain, 2004).

Given these limitations, the proposal of certain authors (Goldman, et al., 1995; Kassim & Zain, 2004; Mates, Gundry, & Bradish, 1998) to structure these agile practices into four main complementary categories allows an initial clarification. The four categories are as follows: (1) practices directed towards mastering change, (2) practices promoting the value of human resources, (3) cooperative practices and (4) practices to create value for customers (or to enrich customers). The practices directed at mastering change essentially aim to give teams the means to develop their reactivity and proactivity through processes of scanning and innovation but also through being able to function "in real time" by communicating information and knowledge related to the organization's vision, its environment and the strategic action plans underlying individual and collective objectives (Dyer & Shafer, 1999; Shafer, et al., 2001).

The agile enterprise also makes use of practices promoting the value of human resources; these emphasize empowerment in order to enable employees to adopt the autonomy and responsibility necessary for dealing rapidly and efficiently with the many unpredictable situations that arise, the volume of information that must be handled and the decisions to be taken (Amos, 2000; Breu, et al., 2001; Dyer & Shafer, 1999; Goldman & Nagel, 1993; Kidd, 1994; Shafer, 1997; Shafer, et al., 2001; Van Oyen, Gel, & Hopp, 2001). This policy of empowerment and continuous change also presupposes that the employees' repertoire of skills will be enriched and increased (Wright & Snell, 1998) through the creation of conditions for continuous learning (Dove, 2001; Shafer, et al., 2001). Several authors also highlight the importance of recognizing the impact of individual and collective action on global performance in order to maintain the motivation (Burke & Terry, 2004; Dyer & Shafer, 1999).

Cooperative practices, both inside and outside the firm, also occupy a crucial place within the agile enterprise in order to reduce response times, improve their offering and increase the firm's potential for innovation (Amos, 2000; Goldman, et al., 1995; Sanchez & Nagi, 2001; Shafer, 1997; Sharp, et al., 1999). Cooperation within the agile firm also relies on concurrent or simultaneous engineering

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practices and functioning by project according to the opportunities identified (Goldman, et al., 1995; Shafer, 1997).

Organizational agility also involves the implementation of practices of value creation for customers; these are focused on customer satisfaction, and particularly on customers' perceptions of the value of the proposed solution (Goldman, et al., 1995). These authors go as far as using the term "customer enrichment": the agile firm proposes personalized combinations of products and services perceived by customers as real "solutions" to their expectations.

The 1991 Iacocca Report recommends adoption of an agile manufacturing paradigm involving competitive foundations, characteristics, elements, and enabling subsystems of agility. Some scholars argue that the Report's conception of agility is ill-defined, and urge clarification and refinement of the concept (Burgess 1994). They assert that the concept of agility needs to be well grounded in management theory (Yusuf et al. 1999). Nevertheless the Report seems to have stimulated numerous publications about agility in manufacturing contexts (Goldman et al. 1995; Kidd 1994; O'Connor 1994; Pandiarajan and Patun 1994; Tracy et al. 1994; Kumar and Motwani 1995; Kusiak and He 1997). Together, academic and practitioner publications such as these have stimulated development of an agile manufacturing paradigm.

Transcending the manufacturing context, researchers are carrying the paradigm forward, emphasizing varying facets and sketching out divergent views of agility. For instance, agility is conceived as broadly as being a total integration of business components (Kidd 1995, 2000) and as narrowly as being rapid changeover from assembly of one type of product to another (Quinn et al. 1997). In analyzing representative manufacturing definitions of agility, two points appear to be emphasized: a firm operates in a changing competitive environment and the firm can take effective action to benefit itself and its customers. In analyzing representative supply-chain definitions of agility, the main theme appears to be that a firm exhibits responsiveness to customers in a turbulent environment. In analyzing representative knowledge-management conceptions of agility, points that are stressed include utilization of knowledge resources in responding to changing conditions and explicit recognition of a need for alertness. In analyzing representative information systems (IS) conceptions of agility, there is recognition of the importance of detecting market opportunities.

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Some authors propose indexes to evaluate the degree to which agile capabilities are implemented (see for example Lin, et al., 2006; Tsourveloudis & Valavanis, 2002; Yusuf & Adeleye, 2002; Van Hoek, Harrison, & Christopher, 2001). For this they use a set of global indicators which make it possible to estimate the costs and response times of firms facing change (for example: reaction time towards change, capacity to anticipate change, rate of innovation, spending on research and development or training, technological capability, customer satisfaction, individuals' flexibility, degree of decentralization of decision making).

Individually, neither alertness nor response-ability gives agility. Both competencies are necessary to realize agility. Both alertness and response-ability need to be timely, flexible, affordable, and relevant. Greater competitiveness can come from the effective integration of these two competencies. By including basic points that run through prior definitions, the result is a relatively comprehensive and unified conception of agility.

Pushing forward from this base, we draw on ideas from entrepreneurship and strategic management disciplines to further develop this conception of agility. There are several reasons for doing so. First, opportunity discovery is at the core of entrepreneurship studies, while means for developing distinctive capabilities to respond to change is a major focus in strategic management research. Second, some researchers have shown that understanding the complementarity between entrepreneurship and strategic management provides promising avenues for researchers examining how organizations sustain competitive advantages in turbulent environments (Barney and Arikan 2001; Ireland et al. 2003; Meyer and Heppard 2000). Third, as effective supply chain management has come to be regarded as major source of competitive advantage for many firms, supply chain researchers have increasingly applied theories and conceptual contributions from strategy to their research (Chang and Grimm 2006; Wisner 2003).

In this direction, we advocate an integration of concepts from the two disciplines into the two main dimensions of the agility construct: alertness and/or anticipation of changes (opportunities/disturbances) and responsive capabilities to changes.

The anticipate change dimension highlights agility as an opportunity-seeking capability from both external and internal vantage points, while the response capability dimension emphasizes resilience in terms of change-enabling capabilities, which are embedded in organizational processes. Although distinct, the two

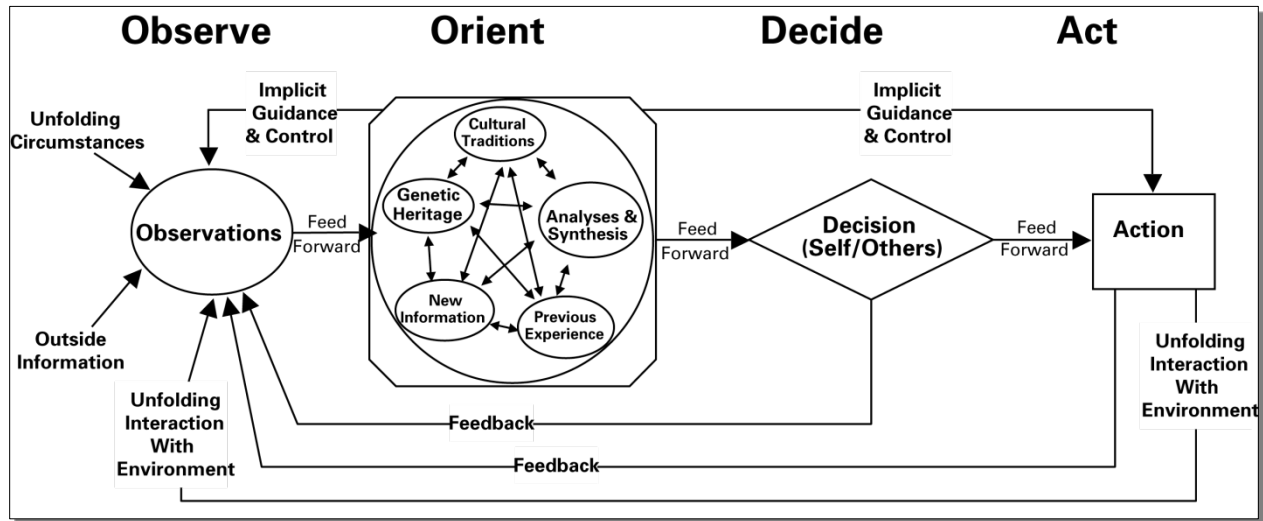
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dimensions of the agility construct are complementary. Some researchers have pointed out that a precursor of effective responses is timely awareness of changes (extant or anticipated) that can affect an organization (e.g., Dove 2005, Holsapple and Jones 2005), which is alertness. Sambamurthy et al. (2003) argue that entrepreneurial alertness is essential for the activation of response capabilities.

According to Sambamurthy et al. (2003), two specific capabilities describe alertness: strategic foresight and systemic insight. Strategic foresight is the ability to anticipate discontinuities in the business environment and the marketplace, threats and opportunities in the extended enterprise chain, and impending disruptive moves by competitors. Understanding that not every opportunity is proper for action, organizations need to be alert not only to opportunity options, but also to those alternatives that can be exploited with their resources and competencies. Systemic insight refers to the capability to consider the interconnections between the organization's capabilities and emerging market opportunities. Strategic foresight is positively correlated with systemic insight.

Responsive capabilities to opportunities and disturbances can be classified into two categories: capability to select actions and capability to enable actions. When relevant change is detected or anticipated, an organization faces alternatives courses of action. Good response ability requires intelligent decision making, based on insightful problem definitions and sound value propositioning skills (e.g., Dove 2005). The capability to enable actions, includes components of coordination, learning, and reconfiguration (e.g., Goldman 1995, Goldsby et al. 2001, Dove 1994, 1999, 2005). We have found the most useful model for decision making is John Boyd's OODA Loop, pictured below.

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The execution of the decision making process may be viewed as involving the cycling through of four distinctive but interdependent stages: 1) **OBSERVATION**, or absorbing information from the environment by all possible means; 2) **ORIENTATION**, or placing this information into a matrix of human understanding and experience; 3) **DECISION**, or selecting a subsequent course of action based upon the likelihood of either offensive achievement or defensive nullification; and 4) **ACTION**, or attempting to operationalize or carry out the previously conceived decision. Collectively, these stages have come to be known as an OODA loop.

The potential value of giving attention to a change varies across organizations in terms of relevance, significance, and priority (Chung 2006). To make good decisions as to which changes deserve responses, organizations must be capable of assessing the value of undertaking a response. The value evaluation component reflects an organization's response capability in making decisions in pursuit of competitive advantages (Dove 2005). Systemic alertness is positively correlated with value evaluation, because systemic insight enables an appreciation of the feasibility of seizing opportunities and treating competitive risks (Sambamurthy et al. 2003).

According to the theory of dynamic capabilities, an organization's capabilities for enabling change-responsive actions lie with their distinctive ways of accomplishing coordination, learning, and reconfiguration (Teece et al. 1997). Coordination refers to the ability to manage dependencies among activities and resources (Malone and

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Crowston 2001). Incentive systems, culture, routines, regulations, or trust are examples of coordination mechanisms. Learning includes the generation of new insights that have a potential to reshape behavior (Huber 1991), and - more broadly - alterations in the state of knowledge assets (Ching, et al. 1992). Reconfiguration refers to the ability to adjust an asset structure, and to accomplish the necessary internal and external transformations (Teece et al.1997).

Agility and Its Related Constructs

Here, we highlight relationships between the unified agility concept synthesized from research literature. Albert and Hayes (2003), for example, identify six facets of agility: robustness, resilience, responsiveness, flexibility, innovation, and adaptation.

Robustness refers to the ability to maintain effectiveness across a range of tasks, situations, and conditions. This notion of robustness is not explicit in the taxonomy, but is related to agility effectiveness in a temporal sense. For instance, over some time period, we can conceive of gauging an individual cell in Table 1 as being more or less robust (e.g., an organization's timeliness of strategic foresight or its flexibility of coordination may be high or low in terms of robustness). *Resilience* refers to the ability to recover from or adjust to misfortune, damage, or a destabilizing perturbation in environment. Although this notion is not explicit in the taxonomy, it refers implementing the response-capability dimension when dealing with challenging disturbances (as distinct from dealing with opportunities).

Responsiveness refers to the ability to react to a change in the environment in a timely manner. The authors stress that a rapid incorrect action is not responsive, and responsiveness can be measured by the relative numbers of opportunities identified and exploited. We shade the cells for strategic foresight, systemic insight, and value evaluation under the timeliness measure to coincide with this conception of responsiveness. The authors describe *flexibility* as the ability to employ multiple ways to succeed and the capacity to move seamlessly between them. They also mention that a hidden capability in flexibility is to foresee multiple futures. Accordingly, we shade the cells for strategic foresight, systemic insight, and coordination under the flexibility measure to represent this view of flexibility.

Innovation refers to the ability to do new things and the ability to do old things in new ways. In the knowledge chain theory, innovation has been found to be a distinct concept from agility as antecedents of competitiveness (Holsapple and Singh 2001; Hartono and Holsapple 2004; Holsapple and Jones 2005). That is, an organization

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can be innovative without being particularly agile, and can be agile without being particularly innovative.

Adaptation refers to the ability to change work processes and the ability to change the organization. This same approach can be used for analyzing the extent of coverage afforded by other conceptions of agility.

A few frameworks have been proposed for characterizing how organizational agility depends on several variables. For instance, Sharifi and Zhang (2001) advance the notion that agility results from integrating agility drivers (environmental pressures and change that yield firm reactions), agility capabilities (strategic abilities of responsiveness, competency, quickness, flexibility), and agility providers (derived from areas of organization, technology, people, innovation) that express these capabilities. Unlike the agility definition introduced in Section 2, this framework of parameters is silent on the possibility of internal drivers (i.e., internal happenings that produce opportunities or challenges), does not consider the alertness dimension of agility, relegates the other major dimension of agility (i.e., response ability) to being an agility "capability," identifies "competency" as a separate "capability" rather than viewing it as effectiveness at being agile (i.e., competence on the dimensions of alertness and response-ability, or from standpoints of flexibility, timeliness, relevance, affordability), uses the speed-related concept of quickness rather than the appropriateness-related concept of timeliness, regards flexibility and quickness as "capabilities" of agility instead of measures or qualities of the degree of agility, appears to be unconcerned with the affordability and relevance of actions, and is restricted to four specific classes of "providers" rather than seeing all organizational resources as being potential "providers" (e.g., organizational knowledge resources or knowledge processing skills are not overtly included).

It has been suggested that agility manifests at multiple levels in an organization. Yusuf et al. (1999) identify three such levels: elemental, referring to the agility of an individual resource (e.g., person, machine); micro, referring to the collective agility of a firm; and macro, referring to inter-organizational agility. There is, however, no discussion of internal/environmental drivers for these levels, resource usage in achieving agility on these levels, how both agility dimensions are pursued on each level, measures of agility on these levels, or relationships among the levels. The agility definition tells us that the key dimensions of agility are alertness and

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According to Drucker (1991), an organization's effectiveness (in pursuing its mission, while adhering to its strategy) stems from getting the right things accomplished in the right ways. This notion of "getting it right" suggests that work can indeed be designed in ways that allow an organization to "get it right" in the face of internal and environmental change (i.e., be effective from the standpoint of agility). How work is designed in an effort to realize this agility ultimately influences an organization's effectiveness. As an example, Ketchen and Hult (2007) regard agility as one criterion for evaluating effectiveness in the case of supply-chain organizations.

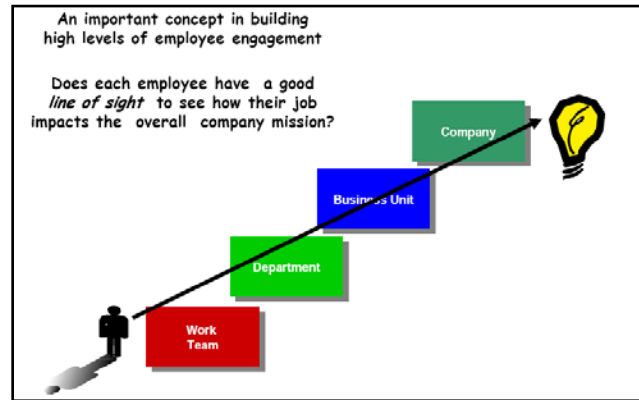
As an organization works to accomplish a particular task, it engages in one or more knowledge-based *work episodes*. We adopt the definition posed by Frenztz and Farrell (1976, p.336): an episode is a "rule-conforming sequence of symbolic acts generated by two or more actors who are collectively oriented toward emergent goals." An organization's work episodes may unfold simultaneously or asynchronously, and each may span multiple geographic locations. Within an episode, work gets done through a complex web of interactions among participating knowledge workers, where a knowledge worker could be a person, organization, or computer system (Holsapple 1995). To accomplish their organizational mandates, knowledge workers collaborate (more or less) in the sense of sharing their knowledge and knowledge-processing skills in ways that allow them to jointly accomplish more than they could individually (e.g., achieve greater agility). The knowledge workers participating in a specific work episode are alert to opportunities or challenges (due to changing environmental or internal conditions) for task adjustments. In the course of using existing or acquired resources to accomplish a task, they integrate their alertness capability with their capabilities for response (proactively/reactively) to execute the episodic task in a timely, flexible, affordable, relevant manner. Where there is episodic agility, the execution of a work episode does not demand rigid adherence to some work design that has been specified at the operational level, but rather is subject to design modification (or even substitution) in response to conditions local to that particular episode.

Operational design is concerned with ways in which work episodes are initiated, performed, and terminated in reaction or pro-action to changes in demand and supply. Agility at this level is the result of integrating an organization's alertness to opportunities and challenges of demand/supply (environmental/internal) changes with the organization's capability to respond (proactively or reactively) to these

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changes by devising new templates for governing work at the episodic level, by allocating resources to work being done at the episodic level, by guiding the timing and duration of work episodes - all in a timely, flexible, affordable, relevant manner (i.e., yielding high agility at the operational work-design level).

The strategic level of work design is concerned with structuring and governing operational work design, so that the latter is aligned with the organization's mission and its strategy for accomplishing that mission. Such alignment is important for being able to create value by exploiting business opportunities, maintaining congruence with a turbulent environment, sustaining competitiveness, and ultimately surviving. Agility at the strategic level of work design is the result of integrating an organization's alertness to opportunities and challenges - both internal and environmental, and particularly in a macro sense - with the organization's capability to respond (proactively or reactively) to these changes by designing new kinds of operational work-design systems or reshaping existing operational work-design systems - all in a timely, flexible, affordable, relevant manner (realizing high strategic design agility).



The governance system for an *agile* organization is a knowledge-intensive work-design network that takes an entrepreneurial approach. The core of this path is the work-design network, comprised of a fluid set of participants that represent the multiple organizations participating in a work network and collaborating in the interest of inventing and improving work design. The foregoing is consistent with common practice in social network research, which focuses on specific types of networks, such as a "friendship network" or "advice network" (Brass 1984; Krackhardt 1990). Here, we focus on a "work-design network." However, the concept of a "work-design network" has not been examined in social network research.

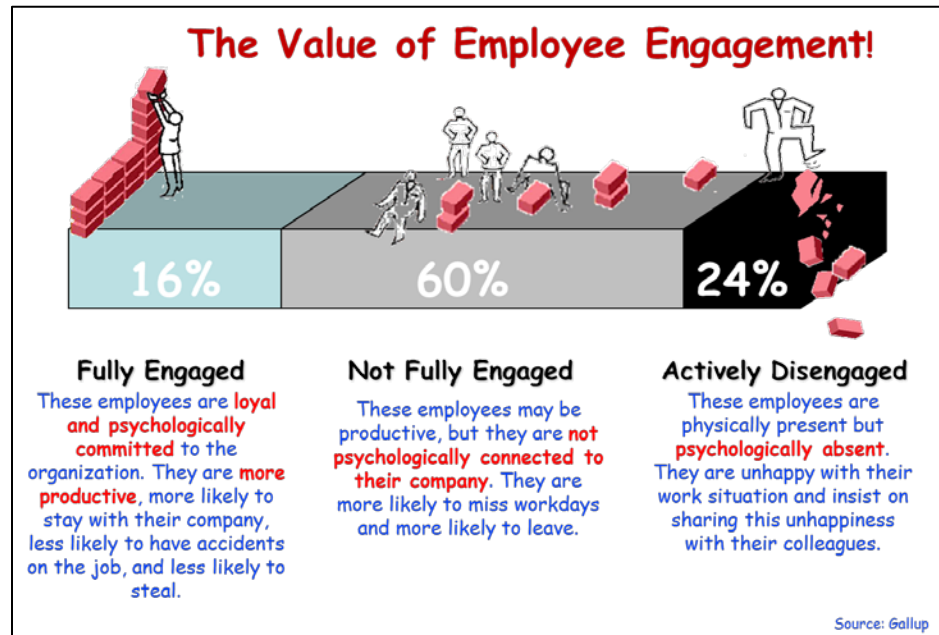
Work design networks do not emerge at random. Instead, they are collective achievements involving numerous participants from public and/or private sectors who pursue their different partisan interests in constructing an infrastructure that sustains the work-design system (Van de Ven 1999) through continuous

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network change involving dissolution with old partners and reformation with new ones (Ching et al 1996). In other words, a work-design network involves a process of *network entrepreneurship*, which represents network actors' activities to create new work design networks, or transform existing ones, in an attempt to strengthen their collective capabilities - such as agility, the focus of this study.

The current literature claims that agility represents a new approach to management and manufacturing, which is profoundly different from a planned mass production (Gunasekaram, 1999; Dove, 1993; Pinochet et al, 1996). It has been also suggested that agility has

serious implication for the nature of work organization and research with employee engagement (Parker and Wall, 1998; Plonka, 1997). It is expected that work in an agile enterprise will become more complex and cognitively demanding due to employment of advanced information and manufacturing technologies. Since agility requires fast response to changes in the market, it increases uncertainty in the workplace and requires from the employees constant adaptation to new requirements, conditions, changes in work processes, and technologies. In addition, flexible technologies lead to increase of the operational uncertainty because of higher variability and complexity in work processes (S. Parker, Wall, & Cordery, 2001). The changes in the work organization due to adoption of agile strategy are expected to provide significant benefits such as increase of employees' autonomy and control over their work, enrichment of their tasks, and subsequently it is supposed to lead to improvement of employees' performance and well-being. Similar benefits were expected in relation to the introduction of such modern manufacturing practices as lean production or just-in-time, which were also considered as an important change from mass production. However, the empirical research has brought equivocal results. A considerable number of studies



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(Landsbergis, Schnall, & Cahill, 1999; Mehta & Shah, 2004; S. Parker, 2003) have shown that new practices have increased job simplification and restricted job autonomy, which in combination with a higher pace of work and increased workload resulted in various negative health effects such as job strain, job depression, and work-related musculoskeletal disorders.

The theory and research in the area of work design provide several suggestions on particular characteristics of work organization that may have especially important effect on employee performance in agile enterprise (Morgeson & Campion, 2003; S. Parker et al., 2001; T. D. Wall & Martin, 1987). It has been established in the literature that work characteristics such as job demand, job control/autonomy, job complexity, and job variety significantly affect employees' behaviors, attitudes, and job performance (Hackman and Oldham, 1976; Karasek & Theorell, 1990). There is no direct empirical evidence that those work characteristics (job demands, job control, and job variety) are related to the agile workforce attributes or agile performance. The past research on work characteristics has been mostly focused on such work outcomes as job satisfaction, motivation and performance. However, recent publications provided evidence that those core work characteristics are also related to such behaviors as proactivity, learning, personal initiative, creativity, and innovations (Ohly, Sonnentag, & Pluntke, 2006; Oldham & Cummings, 1996; S. Parker, Wall, & Jackson, 1997), all of which represent forms or dimensions of agile workforce performance. Higher autonomy and control at work allows workers to respond to problems faster and develop more flexible solution to problems during the operation process (Wall and Martin, 1987). Possibility to solve small operational problems without waiting for the supervisor or other staff allows them to understand better the problems, task or work process, and later to apply that knowledge to prevent or anticipate difficulties. The anticipation and prevention of problems during the work are highly valuable abilities in the agile enterprise.

According to Jackson and Johansson (2003) agility is not a goal in itself but the necessary means to maintain the competitiveness in the market characterized by uncertainty and change. Agility is based on several capabilities found in three main enterprise dimensions: manufacturing, product, and market. Jackson and Johansson (2003) divided agility capabilities into four main dimensions: 1) product-related change capabilities, 2) change competency within operations, 3) internal and external cooperation, and 4) people, knowledge, and creativity. The first dimension is related to the product-related strategies and operation needed to respond to change and uncertainty of the market. The change competency within operations is

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concerned with competencies, methods, and tools required to manage long and short term changes within the production system. Cooperation refers to the ability of enterprise departments to cooperate between each other and ability of whole enterprise to cooperate with suppliers and customers. The final dimension relates to the need to place knowledge and ability of employees as a basis of all actions dealing with the turbulent market changes. Yusuf et. al. (1999) identified competitive foundations of agility as follows: speed, flexibility, innovation, proactivity, quality, and profitability, and claimed that proposed competitive foundations are the absolutely essential characteristics of agile manufacturing that must be achieved in synergy. In this framework Yusuf et. al. (1999) distinguished three aspects of agility related to different levels of enterprise. Elemental agility refers to individual resources (people, machinery and management), micro- agility refers to the enterprise, and macro-agility to the inter-enterprise level. This framework includes four core concepts of agile manufacturing: core competence management, virtual enterprise formation, capability for re-configuration, and knowledge-driven enterprise. Core competences are associated with the corporation's workforce and products that are identified at the individual and firm level. The enterprise core competences are derived from a corporate-wide learning process, integration of diverse skills and technologies, work organization, and capability for inter-organizational cooperation. According to Yusuf et al. (1999) the development of a strategic architecture that presents a corporate wide map of core skills may allow the organization to make rapid changes in focus and afford reconfiguration of the business when the window of opportunity opens. Based on the review of the literature, a list of attributes and practices that constitute the agile organization is proposed and presented in Table 2. Among the reviewed literature the most holistic and concise framework was proposed by Sharifi, Colquhoun, Barclay, & Dann (2001). In this model, Sharifi et al. (2001) identified four main aspects of agile manufacturing: 1) agility drivers, 2) strategic abilities, 3) agility providers, and 4) agility capabilities. The conceptual model describes the relationship between these four elements (see figure 1). The agility drivers represent characteristics of the external business environment in reference to the turbulence and unpredictability of the changes. According to the literature, the agility drivers would force a company to revise the current company's strategy, admit the need to become agile, and adopt an agility strategy. Strategic abilities such as responsiveness, competency, quickness, and flexibility are considered as main attributes of the agile organization that allow successful dealing with changes. The agility capabilities could be achieved by the means of agility providers.

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Agility providers can be derived from four manufacturing areas: organization, technology, people, and innovation. The authors also applied Kidd's (1994) argument that agility cannot be achieved without integration of these four areas.

The assessment of company's agility level requires specific definition and description of the agility attributes. It should be noted, that especially in a modern dynamically changing environment the companies will and should differ in regard to the capabilities used to achieve and maintain agility. However, some general attributes still can be distinguished. Specific categories for each of the major agility capabilities proposed by Sharifi & Zhang (1999) are presented in the Table 3. In this model, responsiveness is considered as the ability to identify changes and respond quickly to them, reactively or proactively, and recover from them. Competency is defined as an extensive set of abilities that provide a basis for productivity, efficiency, and effectiveness of a company's activities. Flexibility is an ability to process different products and achieve different objectives with the same facilities. Quickness is the ability to carry out tasks and operations in shortest possible time.

Despite the differences, all definitions of the "agility" emphasize the speed and flexibility as one of the primary attributes of agile organization (Gunasekaran, 1999; Sharifi & Zhang, 1999; Y. Yusuf et al., 1999). Second important attribute of agility is effective response to change and uncertainty (Goldman et al., 1995; Kidd, 1994; Sharifi & Zhang, 2001). Some of the authors (Sharifi & Zhang, 1999) stated that responding to change in proper ways and exploiting and taking advantages of changes are the main factors of agility. Next common component of published definitions of agility is a high quality and highly customized product (Gunasekaran, 1999; Kidd, 1994; Mccarty, 1993; Tsourveloudis & Valavanis, 2002). In summary agility has been defined in reference to outcome, capabilities, products, workforce, enterprise, and environment that drives the agile development. The main elements of various definitions as summarized by the Yusuf (1999) are as follows:

- Speed and flexibility
- Response to change and uncertainty
- High quality and highly customized products
- Products and services with high information and value-adding content
- Mobilization of core competencies
- Responsiveness to social and environmental issues
- Synthesis of diverse technologies
- Intra-enterprise and inter-enterprise integration

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The models proposed by the Delery & Shafer (2003) and Griffin & Hesketh (2003) were used as the guiding framework for the classification of identified workforce agility attributes, and behaviors. The aspects of the agile workforce performance were grouped in three main dimensions: proactivity, adaptivity and resilience. The *Proactive dimension* refers to the situation when a person initiates the activities that have positive effects on the changed environment (Griffith & Hesketh, 2003). To this category belong such behaviors as: (1) anticipation of problems related to change; (2) initiations of activities that lead to a solution of the change related problems and improvements in work; and (3) a solution of the change related problems. In order to anticipate the change related problems the agile workforce has to monitor and analyze the external and internal environment (market, workplace, consumers, and competition) to identify the changes, opportunities and threats. In order to find solutions of change related problems, the workforce has to be able to analyze and assess the information about change, and to plan response for change. The solution of change related problems require: 1) new ways to perform the job and tasks; 2) improvisation and experimentation; 3) problem solving of novel, ill-defined and complex tasks.

The *Adaptive dimension* is based on the changing or modifying of oneself or their behavior to better fit a new environment. This dimension includes interpersonal and cultural adaptability when dealing with peoples with different backgrounds and experiences. The adaptive dimension also includes constant learning of new skills, tasks, technologies and procedures. Furthermore, adaptive behavior requires professional flexibility: ability to assume multiple roles, change easily from one role to another, and ability and competency to work simultaneously on different tasks in different teams.

Resilience describes the ability to function efficiently under the stress, despite changing environment, or when applied strategies to solve a problem have failed. To this dimension belongs: 1) positive attitude to the changes, new ideas and technology; 2) tolerance of uncertain and unexpected situations, differences in opinions and approaches; 3) tolerance to stressful situations and coping with stress.

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