ENTERPRISE TRANSFORMATION: FORCES AND PROCESSES OF CHANGE

Dominie Garcia

Tennenbaum Institute
School of Industrial and Systems Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332 USA

Abstract: The forces that drive and catalyze enterprise transformation are discussed, and a typology is presented. The process that enterprises use to implement and execute large-scale transformations is also discussed, drawing on both management literature as well as cognitive engineering tools and models as organizing frameworks. Certain prevalent phenomena related to enterprise transformation are considered throughout. The paper presents an initial exploration of the interaction between transformational forces and processes – the further study of which will broaden the scope of understanding of disruptive and potentially enterprise-threatening changes.

Keywords: transformations, enterprise modeling, management systems, cognitive systems

1. INTRODUCTION

Enterprises of all kinds face massive and fundamental change, or transformation, on an increasingly frequent basis due to changing technology, competitor threats, market shifts and customer demands. Transformation is usually a disruptive and costly undertaking, in terms of time, money and other resources, as well as diverting attention from normal operations and production. However, sometimes it is inevitable and necessary for successful pursuit of growth opportunities; other times it is necessary for survival. Many such transformations are catalyzed by external forces shaping the industry in which these enterprises conduct their operations.

Researchers in strategic management and organizational behavior have dedicated attention to the issues of enterprise transformation, though their attention has primarily been focused on very narrow aspects of transformation, depending on the discipline and perspective employed. For example, strategy researchers have investigated the effect of transformation or strategic change on organizational populations and structure (Hannan & Freeman, 1984), and organizational behavior researchers have attended to the effect of internal change on individual satisfaction, productivity and attention (Cummings & Worley, 2001; Kotter, 1995).

Cognitive engineering research has much to contribute to the study of enterprise transformation. The field has evolved as a discipline from human factors and industrial engineering research. Much of the focus in this relatively new discipline is on including contextual and environmental considerations as parts of a more realistic representation of work domains and the impact of those domains on individual performance and behavior (Bainbridge, 1997; Vicente, 1999). The discussion here employs this perspective through the use of cognitive engineering models in the analysis of enterprise transformation.

Enterprises can be analyzed as socio-technical systems, by recognizing the characteristics that make them analogous to other technical systems. The interrelationships between the different members of the systems, be they individuals or teams; the dynamic quality of the system; the myriad ways in which one can define and measure performance, depending on the goals; and the cognitive elements of the key decision makers all define a large complex, dynamic enterprise as a system, much in the same way that we have traditionally defined more narrow and technologically-dependent systems.

Detailed discussion of the analysis of enterprises as systems is beyond the scope and of this paper – Rouse (2004) provides a more extensive discussion. Insights from strategic management research and theories along with perspectives and elements of cognitive engineering tools and models, specifically the Contextual Control Model of Cognition (Hollnagel, 1993), are presented here to provide the appropriate contextual considerations. This model is most applicable to questions about transformation implementation processes, which extends the discussion of transformation forces.

There are several parameters that affect the processes and implementation of transformation within an enterprise that are also considered here – including issues of emergent transformation, decision makers' recognition of transformational events and forces, and the temporal elements inherent in both reacting to and/or anticipating transformational forces, as well as attending to and managing the effect of such forces. Related to these parameters are phenomenological issues that are addressed in the discussion and which also require further research that takes this paper as its starting point. 1) Temporal dimensions – why does it take enterprises so long to recognize the needs for and subsequently pursue transformation? And 2) Cognitive dimensions – how and why do different individuals and enterprise systems recognize the need for transformation with such variance?

These questions can be addressed best by viewing enterprises as complex dynamic systems and by employing insights from both management and cognitive engineering disciplines and research. The combination of these two perspectives allows us a more holistic view of socio-technical systems in times of transformation, providing both diagnostic and prescriptive models.

2 BACKGROUND AND SCOPE

Many radical changes in an environment can affect the workings of an enterprise to the point of massive disruption that can lead to transformation at a system-wide level. There has been much disagreement about the definition of transformation in both the management and engineering literature bases. The primary areas of difference in how researchers define and address transformation as a phenomenon are the scope, reach within the system and level of change that is implied or discussed. The definition of transformation referred to in this piece is drawn from the punctuated equilibrium work of Connie Gersick (1991). She defines the term "deep structure" as follows, in an effort to set boundary conditions on the kind of change examined in her studies:

> Systems with deep structure share two characteristics: (1) they have differentiated parts and (2) the units that compose them "work": they exchange resources with the environment in ways that maintain – and are controlled by – this differentiation.

Therefore, the concept of transformation is one of disruption of that system and its deep structure. In periods of revolutionary change (transformation) "…the deep structure must first be dismantled, leaving the system temporarily disorganized, in order for any fundamental changes to be accomplished." (Gersick, 1991) Clearly, the concept of deep structure is embedded in a system perspective of the enterprise. Examining both the reasons why these structures are dismantled, what issues then ensue throughout the entire system, and the interactions between these two dimensions can lend descriptive insight and prescriptive implications for enterprise managers and decision makers.

The motivation to think about the connections and interactions between contextual forces that drive or instigate transformation and the processes by which those transformations are executed within an enterprise stems primarily from the problem of failed transformation efforts and processes. Periods of transformation are characterized by increased use of resources fundamental to the execution and success of the system. Although transformation may change the fundamental goals that an enterprise defines for itself, the process itself requires that limited and finite resources be diverted away from the main purpose and goals. The longer this process takes and the more uncertainty exists surrounding the intended outcomes of the transformation, the harder it is for the enterprise to realign itself and reorient its resources back towards the goals and outcomes that define its existence.

Large-scale transformations can be emergent or explicitly decided upon by the key decision makers, a subject that will be addressed later in the paper. Regardless of the motivation for undertaking such a large-scale change, the impact is almost always enterprise-wide, affecting all levels of the organization – the structure, the strategic direction, the hierarchy and many times the product and service offerings and markets in which the enterprise conducts its business.

When employing the cognitive engineering perspective it becomes evident that the context in which these massive, enterprise-wide changes are undertaken has an impact on and interaction with the subsequent process and approaches used to implement and execute the change goals. Cognitive engineering has shown us that we cannot separate the user from the environmental context in which he functions (Bainbridge, 1997; Hollnagel, 1993). The environment places direct constraints and pressures on the enterprise and if these pressures result in the need or inevitability of system-wide change, then there will be a reflection of these contextual considerations in the approach taken to deal with the

changes. To try to reduce the rate of failure, we must help managers and decision makers understand these contextual forces and the impact they have on transformation processes, thus providing both diagnostic and prescriptive evaluation tools to help design practices for dealing with the inevitability of challenges inherent in enterprise transformation.

3. TYPOLOGIES OF TRANSFORMATION FORCES

In order to model and categorize the context and environment in which transformations occur at the enterprise level, it is important to understand the major forces that can drive and catalyze these changes. There are several axes or dimensions along which we can categorize these forces – two of which are presented below.

3.1 Drivers of transformation

Rouse (2004) employs a typology or categorization scheme that is divided along lines of what the different driver of change represents to the enterprise undergoing the transformation. Opportunities, threats, competition and crises are dimensions that represent the underlying vision of the need for transformation, mostly as seen through the eyes of the key decision makers or leaders of the enterprise in question. These drivers can act in both emergent and revolutionary ways, though each particular category is very specific to the position and point of view of a specific enterprise. This typology implies an active cognitive process on the part of the enterprise leaders when faced with either mounting changes that imply a large-scale transformation (emergent) or with the decision to drastically transform the enterprise to respond to the environmental factors, be they opportunities, threats, competitive moves or crises.

3.2 Forces of change

Another way to categorize the contextual forces that catalyze organizations to transform is along market or industry dimensions. This typology differentiates between transformation forces along major categories that are indicative of industry trends and pressures. The majority of transformation forces, whether emergent or cognitively attended to by decision makers, fall into four categories: technological changes, regulatory changes, market structure changes, and financial pressures. These are not mutually exclusive with the categories presented above, but do present a different division of the context in which the changes take place. Each factor or force will have different effects on the system in times of transformation and will also imply a different process to deal with the implications of the transformation.

Technology changes can imply a total business or operations process change, due to innovation in the technology available or in the product or offerings of an enterprise. In either situation, an enterprise facing massive technological innovation and development must adapt itself and its skills, processes and perhaps even strategies to the implications of the new technology.

Regulatory changes are most evident in those industries that are deeply affected by government and industry rules, such as banking, law, government agencies and contractors, and other public or quasi-public organizations. One such example is the repeal of the Glass-Steagall regulations that affected the banking and financial services industries. (Davis, 2004; Hoover's, 2004) By repealing the walls that divided banks and investment houses, the government allowed banks and financial services companies to expand their offerings and the markets they served, providing a tremendous growth opportunity, which implied the need for transformation of the structure, strategy, skills, and processes that the enterprises in these industries needed to employ in order to compete and succeed in a new industry.

Market structure changes are more subtle and difficult to recognize, but have a tremendous transformational impact on the organizations in such situations. The forces and changes to which the organization must adapt include changes in customer tastes and valued attributes of a product or service, new entrants competing with incumbents, global competition increasing, and economic forces that shift purchasing power or abilities of different market segments. Fundamentally, the competitive environment undergoes a significant enough change that necessitates the organization to transform its internal structure in order to be competitive and successful in its new environment. Often these market changes creep up on the organizations involved because they are the result of many small, incremental forces and shifts in tastes, demographics, competitive pressures, and other economic forces over time.

Similar to market shifts, financial pressures that catalyze transformation are most often the result of an accumulation of many smaller, incremental changes and failures along the way, that at some

critical point reach crisis for an organization. The most obvious state related to financial pressures is imminent bankruptcy, though several other financial situations can also necessitate a massive organizational change. If we consider this most extreme case, bankruptcy, we can understand that when faced with this situation, regardless of the underlying reasons why an organization reaches this point of financial crisis, the internal structure must fundamentally change and shift to not only deal with the imminence of complete failure, but also to effectively compete in the future, once out of the crisis mode. The deep structure of the firm must reflect a new focus on first getting out of the financial crisis and then on continued operations and competition in its market. This may be coupled with or even instigated by any of the aforementioned forces, such as technology innovations or market shifts.

4. PHENOMENA OF INTEREST

The typology and categorization of transformation forces allows us to understand and diagnose the magnitude and the context in which this disruptive process takes place. Understanding the context is not an end in and of itself, but rather allows us to then place the process and outcomes of transformation within a broader understanding, allowing for the exploration of the interaction between these forces and the consequent processes.

Often, small incremental changes that of themselves do not bring about large-scale change within the enterprise may compound over time, causing transformation to emerge, in an unanticipated way. The questions related to such situations are then: why it so often takes leaders and decision makers (who include among their tasks the ability to scan and read the environment as it affects the enterprise) so long to recognize the need for and the actual pursuit of transformation? And, why is there such a large variance in the ways that different enterprises and individuals recognize the need for transformation? These questions are not independent and in fact one may be an extension of or provide the answer for the other.

We know from many studies and theories that attention is generally focused on the most salient issues and factors. Most key decision makers in complex dynamic enterprises are tasked with high-level strategic decisions and foci, although are often rewarded based on shorter-term outcomes and successes. Because transformation is a long-term endeavor, there is little incentive to deal with and pursue costly transformation. Some of the concepts and modeling techniques included in the Contextual Control Model (Hollnagel, 1993) can help reorient attention and cognition towards transformational forces earlier, either by shortening the time span needed to attend to transformation or by avoiding costly delays.

The focus on the interaction between the forces that catalyze enterprise transformation and the processes used to implement the transformation is best addressed by including attention to the high variance of both time and recognition of the need for and the pursuit of transformation, even in situations of crisis or impending crisis. The supposition here is that the typology that provides a categorization scheme along external, contextual lines for the forces of transformation, will help us understand what some of the factors are that contribute to the lack of resources and decisions associated with effectively managing the inherently dynamic and tumultuous aspects of transformations.

5. CONTEXTUAL CONTROL MODEL

In searching for a way to model the effects of behavior and cognition on individuals and even groups, cognitive engineering researchers have developed many different ways of approaching the task. Traditionally, much of the modeling work has centered on tasks, individual interactions with technology (specifically computers) and certain aspects of the domain in question (Bitan, Meyer, Shinar, & Zmora, 2000; Javaux & Polson, 1999; Parasurman & Riley, 1997). One area that has been overlooked, and which is addressed by Hollnagel in his development of a Cognitive Control Model of Cognition (1993), is the different stages of competence and control that interact with and also directly affect the performance and behavior of individuals in a variety of task domains.

Although the development of this model and the discussion surrounding the different stages is focused on the individual worker, I believe many of the concepts can be extrapolated and applied to understanding entire systems, such as enterprises. Furthermore, the model addresses issues of process in delving into the variables that influence the transition from different stages of control and what contextual factors influence the execution and existence at different levels of competence and attention. Following is a description of the various parts of the Contextual Control Model, addressing at each turn how the concepts and analysis are applicable to enterprise systems, and even more so under situations

of transformation. Space considerations for this paper limit the extent to which all parts of the model can be described, but the aspects most relevant to enterprise transformation are discussed.

5.1 Introduction to the Model

One of the motivating factors for Hollnagel's development of the Contextual Control Model is to deal with what he describes as the inaccurate reflection and representation of how individuals actually perform in situations. The author differentiates between analyzing task goals and cognitive goals as the first step in accurately depicting and therefore designing better systems for different tasks and stages of cognition (with cognitive goals captured in this new model). This includes a consideration of existing needs and constraints, rather than a modeling of what should happen under idealized situations.

The same concept of cognitive goals can be used in thinking about the enterprise as a whole, or in analyzing the cognitive goals of the key decision makers. This way, transformation situations and the processes used can be modeled as a series of stages of different goals with the particulars of each situations modeled accordingly. This can help draw the attention of decision makers to cognitive goals and subsequently associated procedures, tasks and/or behaviors that pertain to each stage of transformation.

5.2 Competence and Control

The Contextual Control Model in addition to modeling and considering reality as influenced by constraints, goals and environmental variables, includes an analysis of both the degree of control at each stage, as well as the level of competence of the individual, which directly impacts the completion of the goal and the cognitive attention to any particular situation. These two parameters together, competence and control, form the representation of any particular situation and the commensurate reaction or behavior.

In the situation of enterprise transformation, competence and control parameters can be modeled at the enterprise level. For example, enterprise competence is a function of the previous successes and failures of an enterprise in its given environment, which in turn are functions of system behavior, operations, and the successes and failures of key decision makers. The idea of core competences for organizations is a well developed one in the management literature (Prahalad & Hamel, 1990; Williamson, 1999). Similar to what Hollnagel describes in developing the model, what the enterprise is capable of corresponds to the needs, demands and abilities of the enterprise as reflected in the cumulative knowledge, skills and processes within the system.

5.3 Control modes

Hollnagel describes four control modes – scrambled, opportunistic, tactical and strategic – that fall along a continuum, with strategic control being perhaps the ultimate mode that an individual (or enterprise) strives to achieve. Each mode is determined by several factorss, including the perception of subjectively available time, objectively available time, the rate of change of the process in question, and the knowledge or experience of the individual (or enterprise). The questions of interest then are the conditions under which someone shifts or moves from one mode to another, and the characteristics of subsequent performance in each mode.

In order to describe the transition or movements from one mode to another, certain other parameters are considered: the determination of the outcome of the previous action (which is interdependent with the mode in which the action takes place) and the estimation of the subjectively available time. In addition, consideration of the number of goals and the variability of plans (which is dependent on the experience with the situation) help to provide more detail and description of the performance indicative of each mode as well as the transitions between different modes. Analysis of these realistic factors can help decision makers to focus on the most salient questions at any given stage, recognize where the enterprise and its members are functioning along the control mode continuum, and then appropriately design plans and operations to execute the priorities and goals.

The first two modes (scrambled and opportunistic control) are to be avoided because they are primarily reactive, unplanned and short-term control stages, where performance is severely reduced because there is no time or ability for reflection. An enterprise (or individual) may find itself in these modes because of emergent transformation forces that have not been previously attended to. Performance in these modes is inefficient and analogous to what has been described above in classic large-scale change situations, where the primary resources of the enterprise are redirected to deal with the

transformation at hand, and the performance or outcomes of the enterprise suffer as a consequence.

The tactical and strategic modes of operation are those to be aimed at achieving, especially during transformation and other disruptive situations. The choice between these two modes is determined by the goals, competencies and other contextual factors. Given the environment and the experience base, an enterprise may need to switch back and forth between these two modes, and therefore be able to attend to both longer term (strategic mode) and shorter-term (tactical mode) goals and needs.

6. NEXT STEPS

In order to test the Contextual Control Model to describe enterprise transformation processes and their interactions with different transformational forces, field studies and empirical research must be conducted. I have begun the process of gathering data to validate the typology of transformation forces presented here, by interviewing industry leaders in a variety of industries, and conducting larger focus group discussions. The interviews and focus groups conducted produce qualitative data that is categorized and counted according to the typology.

Enterprises that have experienced massive transformation then must be studied, both through observation and interviews, as well as through financial and other published data, to see if the propositions here about using the Contextual Control Model fit. The model will produce a categorization and structuring of different modes of transformation processes, including the analysis of the forces that were instrumental in driving the changes. Throughout the research, the phenomena of interest – questions of timing and recognition of transformation – will be the framework for the underlying problems that drive the studies.

7. CONCLUSION

The discussion in the this paper is the first step in integrating analyses of forces that drive enterprise transformation and the approaches and processes used to implement those transformations. Both strategic management and cognitive engineering fields contribute a contextual perspective and approach that draws attention to applicable modeling and representations. Transformation is a necessary process that all enterprises undergo at some point in their life cycle, and understanding the dimensions related to transformational phenomena will help us attend to the effects more successfully.

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