

Extending Life Cycle Models for a Repeatable Innovation Strategy

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Abstract. The goal of many organizations is to be recognized as a business leader that consistently delivers innovative products and services. Different types of life cycle models have been used to guide the systems development efforts and implementation processes within these organizations, all with various outcomes. This paper first explores the reasons why innovation is so elusive, so difficult to achieve and almost impossible to predict. It then explores the possibility of enhancing existing life cycle frameworks so that innovation and break-through accomplishments become part of the organizational structure, not just a random or one-time achievement. It also identifies modern examples and other research data to identify such factors as the expansion of knowledge assets, new patterns for collaboration, environments for radical creativity and transformational skill sets. These findings suggest that a life cycle methodology with the necessary attributes can increase the probability for achieving a repeatable process for innovation.

1. Introduction

Today's most dynamic and successful organizations face constant pressure to expand market share with products and services that are attractive to a shifting and sophisticated global population. Organizations, especially those operating in competitive, technology-driven environments must establish strategies that embrace creativity and innovation in order to maintain hard-won reputations for consistently providing exciting and desirable products [1]. Unfortunately, organizations often repeat strategies that proved effective in the past, but find that those old patterns no longer provide the spark captured by systems and products that are considered truly innovative. This leads to the question: can a life cycle process be used to define, capture and be systematically applied to provide businesses with a repeatable format that consistently delivers innovative and cutting edge developments?

2. Architecting Innovation

Innovation is a recognizable element that expands, defines and delivers solutions to both existing and unimagined needs in a novel and effective manner. Innovation differentiates companies by providing an aura of originality and creativity that customers appreciate and competitors tend to imitate. Innovative products and services can influence consumer trends and have the potential to impact markets on a global level. But this achievement is not guaranteed nor can it be predicted with assurance, even with businesses known for past exceptional innovative accomplishments.

There are several factors that make implementing a repeatable process that delivers innovative products difficult. The most dominant is the perception of risk and the uncertainty that is inherent with any new, untried endeavor [14]. The investments in knowledge, time and financial commitments needed to identify and develop untried products require a leap into the unknown that in the end, still could fail to capture customer expectations or fall short of business objectives. Many corporate leaders view the aggressive investments that innovation demands as "a high-risk, high-cost endeavor, that promises uncertain returns" [20] with "challenges [that] often are considered just too high a risk" [14].

Creating a culture of innovation is a commitment that moves the organization beyond the expected modes of thinking and past its current business practices. The decision to be a corporate innovator requires developing the resources and promoting a strategy for generating the new concepts needed for a "radical model that challenges fundamental assumptions" [15].

A workable life cycle radical model for innovation would necessarily provide a usable framework that applies a repeatable and realistic structure lifecycle. A suitable methodology would encourage a system-wide, possibility-oriented approach that would be more conducive for innovative systems and work products. This type of non-linear process would represent a significant departure from the more traditional ends-oriented approach used by most enterprises today [2].

There are many determinants that can prove useful for calculating an organization's level of commitment to systematic innovation. There are, for example, methods and techniques that map the degree of an organization's performance in relation to global trends and technology developments [3]. The potential for establishing a successful innovation environment can actually be estimated by considering the impact on four specific elements: product, process, position and paradigm [3] and the amount of resources and degree of importance that the enterprise applies to each one.

Life cycles often include iterative stages where system capabilities, functional requirements, technical enhancements and design features are periodically updated to keep a product or service competitive and current. Innovation, on the other hand, requires a paradigm shift that results in something entirely original, that is recognized as "something new that didn't exist before" [2]. The term radical innovation describes the acquisition of a truly unique offering or a novel technology that differs dras-

tically from any preexisting alternatives. It requires a different cognitive frame of reference, one that generates new ideas and assumptions and becomes much more than just the introduction of a leading-edge product or a new service or technology [4]. This is achieved by, what may be regarded at first as, a risky commitment to an ambiguous, resource-intensive learning process. Success often results in changes that lead to the displacement of system capabilities and knowledge investments already established by other competitors and major business players [4].

Radical innovation can indeed be disruptive [5]. But, it is also synonymous with ground-breaking, future-focused products which, in turn can become engines for rapid economic growth with the “power to create entire industries” [6] and change the competitive landscape. Clearly, committing organizational resources to the pursuit of innovation can be an extremely uncertain and risky process for a number of reasons [3]. Previous assumptions derived from existing technologies suddenly become irrelevant in that the available existing knowledge and experiences have little value in the context of the new innovation [4]. But upsetting the existing status quo in this manner can also be viewed as a corporate advantage.

3. The Dynamics of Innovation

Can the concept of innovation realistically be deconstructed, analyzed and reapplied by an organization into a repeatable lifecycle process that consistently generates inventive products? Developing a culture dedicated to innovation is the stated goal of many organizations. It is often included in their strategy and mission statements and identified as a technology or system objective. Unfortunately, achieving this goal is unpredictable; few businesses “seem to [understand] the very notion of innovation and how to apply it... innovation is often misunderstood [and] considered too difficult for practice” [2].

Innovation is characterized by the degree that a new system, product or process is developed from new technology and ideas that differ substantially from what existed before [6]. A life cycle that consistently achieves dramatic break-throughs requires structures and processes that create emergent, non-linear improvements on a recurring basis. The real value comes from combining the “knowledge... the direction, the purpose, [and] the focus [toward] innovation” [2]. Such a knowledge-focused model would redefine connections between the acquisition procedures, the application of new tools, changing technology platforms, and ever-rising expectations to expand assumptions and possibilities [4]. These then become the new knowledge assets that establish the organization’s ability to “identify, acquire, integrate and exploit” [4] both the practical and intangible elements needed to support a life cycle process that is conducive to an on-going culture of innovation [2].

Innovation defies prediction; if it was predictable, “then it wouldn’t be innovation” [2]. Nevertheless, increasing opportunities for innovative activities require that all system resources, components, strategies, etc. collectively form an environment where a higher degree of creative freedom becomes a possibility [2]. Clearly, expansion of creativity would be a major factor of the innovative life cycle methodology, where expecta-

tions become free of the deterministic restrictions of existing system-building assumptions. This would encourage a systematic culture that promotes the kind of corporate mindset that is “necessary to invigorate and regenerate the firm’s life” [7]. In this case, that means a dynamic shift toward fostering non-linear learning experiences by “encouraging, recognizing, and rewarding creativity” [1]. These inducements stimulate the long term conditions of generative learning that are needed for “architecting the dynamics of innovation” [2]. In this context, innovation becomes a real possibility.

4. Life Cycle Models

Companies known for reliably delivering products and services that consistently raise the bar for innovation and new advancements are usually considered to be focused and forward thinking as well. Credit for this is usually given to the “free will and creative activity of the [firms] and their decision making” [7] as well as the “know-what, know-why, and know-how” [4] that is strategically encapsulated by the business and product life cycle models.

One common factor that “all systems and models have is that they involve abstractions” [8]. A model for innovation would be no different. Unfortunately, as stated, organizations, like other entities, tend to pursue the same strategies that proved effective in the past. The tried and true organizational structures and knowledge baselines must somehow bend with changing technologies and expectations, if not, they may become dated and ineffective when new stages of development occur. Yesterday’s great and admired innovations soon become technological relics of the past as they are unceremoniously discarded for the next new thing.

Many companies have enjoyed such impressive successes with their innovative achievements in the march toward today’s modern computing capabilities [19]. Corporate reputations have been preserved over time through aggressive investments in new technologies, but many of these companies are no longer regarded as leaders of innovation. The pioneers in mainframe computing, for example, missed the emergence of the mini-computer. Many minicomputer manufacturers, in turn, failed to capitalize on desktop computer [17].

The rise of mobile computing and social marketing presented additional opportunities for the forward thinking organization. Innovation is now expected. Tracking consumer opinions and influencing acceptance decisions is considered a competitive advantage. This advantage can actually be achieved by the manipulation of a specific set of “innovation attributes” [18]. These attributes include controlling the perception that the product is superior to its rivals, that the product is compatible with personal values and that the complexity associated with understanding and using the product falls within an acceptable range [18].

The goal then is to establish a life cycle methodology where success is defined by continually identifying the key factors needed to transform and restructure the activities that lead to new break-through opportunities [5]. “The life cycle literature is replete with different models” [7] attempting to identify the difference-making factors and then re-composing them into new

Table 1: Meta-system Element and Coordinating Relationships [8]

Meta-System Elements	Coordinating Relations	Description
The Empirical	Committing	Conclusions are drawn from research data
The Actual	Convincing	Information that is bound by the context of its own situation
The Real	Adjusting	Contains the deeper-level regularities of system behavior which drives the other two

sets of rules, phases, iterations or build components. Appropriate models must provide the system guidance and controls throughout all life cycle phases that can be applied to both the business strategies and the changing competitive environment [10]. Successful organizations manage to weave the concept of simultaneously running their business while changing their business at the same time [11]. This ambidextrous behavior applies to “the organization’s strategies, systems, scorecards and incentives” [11].

5. Models and Examples

There are two models that offer elements that are useful for advancing the concept of an innovation life cycle. The first comes from the Theory of Retroduction Abduction where empirical research and pre-existing bodies of abstract ideas are used to develop conceptual models [8]. One model, based on the Software Development Life Cycle (SDLC) identifies three aspects that form a basic framework for synthesizing and formalizing these empirical data into a life cycle meta-system. These elements consist of: the empirical, the actual and the real. Another similar model, based on the same reasoning and SDLC methodologies, was cited as representing a more modern management system that was recently developed and used in China [8]. This model extends the original elements by examining their relational impact on individual life-cycle events regarding the levels of “adjusting, convincing, and committing” [8]. These three relational coordinates link to the three meta-systems elements. They differ in that they are seen as themes that explain the relationships needed for coordinating and adjusting subsequent life cycle stages by acting together to solve any problems that surface. Table 1 compares the meta-system elements with the relational values.

These concepts not only suggest an approach for identifying and embodying the intangible factors and attitudinal shifts needed for sustained creative thinking, they also describe meta-system elements by which innovation methodologies can be developed and operated.

The second example is derived from the Theory of Absorptive Capacity (ACAP) which represents a knowledge-based model for radical innovation [4]. The ACAP model defines an organization’s behavioral routines by demonstrating how effectively it identifies, acquires, integrates, and exploits knowledge relative to the quality of its domain intelligence and access to technologies. The quality of an organization’s total knowledge portfolio is defined by two dimensions, according to: a) “what it knows – its knowledge base” and, b) “what it does – its routines”[4]. This directly corresponds to the dual concept of idea generation and idea implementation [12]. The model is depicted in Figure 1.

This model shows how specific factors affect different types of organizations by focusing on their internal and external knowledge adoptions. These adoptions can occur either separately or in combination, depending on the knowledge base, but when successful, they result in the generation of new knowledge paradigms. In other words, the analytical results reveal the level of innovation potential by simply showing that an outcome “can be defined as the number of...innovations it adopts” [4] through the management and execution of the corporate knowledge assets defined in Table 2.

When traditional publishing firms were faced with the challenges of the emerging, on-demand publishing market, they were forced to develop new methods for delivering specific customer-defined information services, media formats, etc. To succeed, the firms had to restructure the basic knowledge assets already embedded within their data stores and shift into new capabilities and strategies for product development and information dissemination [16]. This absorption process, along with a redefinition of assumptions, allowed data to be reconfigured and transformed into structures that supported the implementation of innovative information products and content delivery systems.

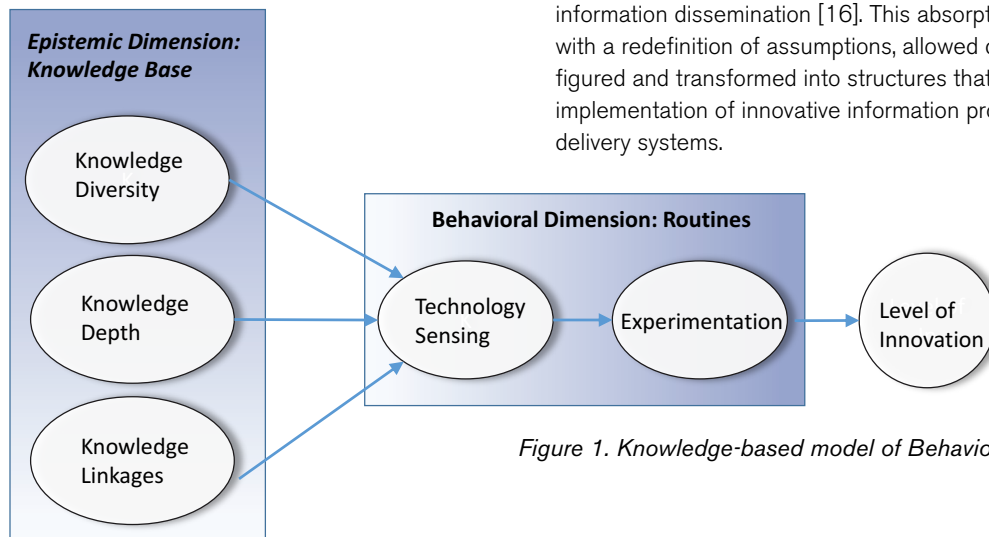


Figure 1. Knowledge-based model of Behavior and Innovation [4]

Table 2: Knowledge Assets and Descriptions [4]

Asset	Description
Knowledge Diversity:	Denotes the extent to which a wide distinction of unique knowledge elements influence specific tasks
Knowledge Depth:	Represents the level of detail, knowledge quality, and depth of domain expertise that can be leveraged.
Knowledge Linkage:	Refers to the channels through which gathered and accumulated, the relationships formed with vendors, clients, scholars and experts.

When included as building blocks in life cycle strategies, these factors encourage innovation by increasing cooperative creativity, establishing non-linear channels for thoughtful collaborations, and allowing for the possibility of serendipity, etc. This kind of business intelligence, in turn has a direct and long-term impact on the organizational behaviors and decision-making responses when endorsed in the life cycle methodology.

6. Transformational Leadership

Repeatable innovation requires that an organization's life cycle methodology has the built-in foresight and flexibility, on a systems level, to adjust to changes in the direction of technological discoveries, the competitive environment, the business mission, and to product or service outcomes [10]. Ultimately, however, it is the capabilities demonstrated by talented leadership that plays an integral part in the process by setting the high expectations and directing the activities needed to sustain environments that favor creativity and innovation [13].

It was found that skilled transformational leaders actually enhance the probability for innovative outcomes [1]. They serve as critical influences for overcoming organizational and team hurdles by providing a specific and recognizable transformational leadership style.

Transformational leaders display a certain degree of behaviors that emphasize change, encourage out-of-the-box thinking and promote individual empowerment [12]. They accomplish this in two ways. First, by constructing a creative environment that favors innovation and second, by directing the strategic goals, activities and expectations needed to sustain the performance of project members and other contributors at high levels [13].

Leaders display transformational abilities by articulate a compelling and inspirational vision. They raise the confidence, aspirations and performance expectations of their followers [1]. This lends proof to the suggestion that "leadership is among the most important factors affecting innovation" [1]. The transformational leader establishes a creative knowledge environment or CKE which ensures that "the social and organizational characteristics at the team and organizational levels, have a crucial influence on the innovation processes" [13]. They motivate the team with an attractive vision of future states.

Transformational leaders are skilled at motivating people and their leadership style convinces teams to buy into their visions and work ethics by steering workplace perceptions in ways that influence and encourage the desirable innovation behaviors [1]. Quality team performance is defined as the quantity of implemented ideas "in terms of [their] novelty, magnitude, radicalness and effectiveness"; in other words, the degree of originality and inventiveness; the characteristics of innovation [12].

7. Conclusion

Many organizations are capable of producing a system, a product or a service that is considered radically innovative, but repeating the feat is often elusive and in many cases impossible. New technology developments combined with shifting collaboration patterns can expand the corporate knowledge base and create new possibilities that never existed before. The factors that contribute to creative, non-linear, out of the box thinking when identified and isolated can be decomposed and reassembled into an enhanced life cycle methodology where innovation becomes a repeatable part of the development process. Innovation can never be predicted, of course. But with focused, transformational leadership, a solid understanding of necessary system meta-elements, and an environment that encourages radical creativity, a foundation can be developed where innovation is expected and can be sustained.

So, to answer the question posed in the introduction: can a repeatable life cycle be defined and applied as a business process that consistently delivers innovative and cutting edge systems and products? Well, the answer needs much more research, but the foundational elements for such a consideration certainly already exists.

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