

Enhancing Enterprise Intelligence

Leveraging ERP, CRM, SCM,
PLM, BPM, and BI

Vivek Kale



CRC Press

Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business
AN AUERBACH BOOK

Enhancing Enterprise Intelligence: Leveraging ERP, CRM, SCM, PLM, BPM, and BI
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© 2016 by Vivek Kale
ISBN 978-1-4987-0597-4

CRC Press
Taylor & Francis Group
6000 Broken Sound Parkway NW, Suite 300
Boca Raton, FL 33487-2742

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CRC Press is an imprint of Taylor & Francis Group, an Informa business

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Printed on acid-free paper
Version Date: 20151111

International Standard Book Number-13: 978-1-4987-0597-4 (Hardback)

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Library of Congress Cataloging-in-Publication Data

Names: Kale, Vivek.
Title: Enhancing enterprise intelligence: leveraging ERP, CRM, SCM, PLM, BPM, and BI / Vivek Kale.
Description: Boca Raton : Taylor & Francis, 2016. | Includes bibliographical references and index.
Identifiers: LCCN 2015031118 | ISBN 9781498705974 (alk. paper)
Subjects: LCSH: Production planning--Data processing. | Manufacturing resource planning--Computer programs.
Classification: LCC TS176 .K319 2016 | DDC 658.5/03--dc23
LC record available at <http://lccn.loc.gov/2015031118>

Visit the Taylor & Francis Web site at
<http://www.taylorandfrancis.com>

and the CRC Press Web site at
<http://www.crcpress.com>

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Intelligent Enterprises

AGILE ENTERPRISES

The difficult challenges facing businesses today require enterprises to be transitioned into flexible, agile structures that can respond to new market opportunities quickly with a minimum of new investment and risk. As enterprises have experienced the need to be simultaneously efficient, flexible, responsive, and adaptive, they have transitioned themselves into agile enterprises with small, autonomous teams that work concurrently and reconfigure quickly, and adopt highly decentralized management that recognizes its knowledge base and manages it effectively.

Enterprise agility is the ability to be

1. Responsive—Adaptability is enabled by the concept of loosely coupled interacting components reconfigurable within a unified framework. This is essential for ensuring opportunity management to sustain viability.

The ability to be responsive involves the following aspects:

- An organizational structure that enables change is based on reusable elements that are reconfigurable in a scalable framework. Reusability and reconfigurability are generic concepts that are applicable to work procedures, manufacturing cells, production teams, or information automation systems.
 - An organizational culture that facilitates change and focuses on change proficiency.
2. The ability to be intelligence intensive or to manage and apply knowledge effectively whether it is knowledge of a customer, a market opportunity, a competitor's threat, a production process, a business practice, a product technology, or an individual's competency. This is essential for ensuring innovation management to sustain leadership.

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The ability to be intelligence intensive involves the following aspects:

- Enterprise knowledge management
- Enterprise collaborative learning



When confronted with a competitive opportunity a smaller company is able to act more quickly, whereas a larger company has access to more comprehensive knowledge (options, resources, etc.) and can decide to act sooner and more thoroughly.

Agility is the ability to respond to (and ideally benefit from) unexpected change. Agility is unplanned and unscheduled adaption to unforeseen and unexpected external circumstances. However, we must differentiate between agility and flexibility. Flexibility is scheduled or planned adaptation to unforeseen yet expected external circumstances.

One of the foremost abilities of an agile enterprise is its ability to quickly react to change and adapt to new opportunities. This ability to change works along two dimensions:

- i. The number or “types of change” an enterprise is able to undergo
- ii. The “degree of change” an enterprise is able to undergo

The former is termed as range, and the latter is termed as response ability. The more response-able an enterprise is, the more radical a change it can gracefully address. Range refers to how large a domain is covered by the agile response system; in other words, how far from the expected set of events one can go and still have the system respond well. However, given a specific range, how well the system responds is a measure of response or change ability.



Enterprises primarily aim progressively for efficiency, flexibility, and innovation in that order. The Model Builder, Erector set, and LEGO kits are illustrations of enterprises targeting for efficiency, flexibility, and innovation (i.e., agility), respectively.

Construction toys offer a useful metaphor because the enterprise systems we are concerned with must be configured and reconfigured constantly,

precisely the objective of most construction toys. An enterprise system architecture and structure consisting of reusable components reconfigurable in a scalable framework can be an effective base model for creating variable (or built-for-change) systems. To achieve this, the nature of the framework appears to be a critical factor. We can introduce the framework/component concept, by looking at three types of construction toys and observe how they are used in practice, namely, Erector Set Kit, LEGO Kit, and Model Builder's Kit.

You can build virtually anything over and over again with any of these toys; but fundamental differences in their architecture give each system unique dynamic characteristics. All consist of a basic set of core construction components, and also have an architectural and structural framework that enables connecting the components into an unbounded variety of configurations. Nevertheless, the Model Builder is not as reusable in practice as the Erector Set, and the Erector Set is not as reusable or reconfigurable or scalable in practice as LEGO, and LEGO is more reusable, reconfigurable, and scalable than either of them. LEGO is the dominant construction toy of choice among preteen builders—who appear to value experimentation and innovation.

The Model Builder's kit can be used to construct one object like airplane of one intended size. A highly integrated system, this construction kit offers maximum esthetic appeal for one-time construction use but the parts are not reusable, the construction cannot be reconfigured, and one intended size precludes any scalability. It will remain what it is for all time—there is zero variability here.

Erector Set kits can be purchased for constructing specific models, such as a small airplane that can be assembled in many different configurations. With the Erector Set kit, the first built model is likely to remain as originally configured in any particular play session. Erector Set, for all its modular structure, is just not as reconfigurable in practice as LEGO. The Erector Set connectivity framework employs a special-purpose intermediate subsystem used solely to attach one part to another—a nut-and-bolt pair and a 90-degree elbow. The components in the system all have holes through which the bolts may pass to connect one component with another. When a nut is lost, a bolt is useless, and vice versa; when all the nuts and bolts remaining in a set have been used, any remaining construction components are useless, and vice versa. All the parts in a LEGO set can always be used and reused, but the Erector Set, for all its modularity, is not as reusable in practice as LEGO.

LEGO offers similar kits, and both toys include a few necessary special parts, like wheels and cowlings, to augment the core construction components. Watch a child work with either and you will see the LEGO construction undergoes constant metamorphosis; the child may start with one of the pictured configurations, but then reconfigures the pieces into all manner of other imagined styles. LEGO components are plug-compatible with each other, containing the connectivity framework as an integral feature of the component. A standard grid of bumps and cavities on component surfaces allows them to snap together into a larger configuration—without limit.

The Model Builder's kit has a tight framework: A precise construction sequence, no part interchangeability, and high integration. Erector Set has a loose framework that does not encourage interaction among parts and insufficiently discriminates among compatible parts. In contrast, each component in the LEGO system carries all it needs to interact with other components (the interaction framework rejects most unintended parts), and it can grow without end.

Stability versus Agility

Most large-scale change efforts in established enterprises fail to meet the expectations because nearly all models of organization design, effectiveness, and change assume stability is not only desirable but also attainable. The theory and practice in an organization design explicitly encourages organizations to seek alignment, stability, and equilibrium. The predominant logic of organizational effectiveness has been that an organization's fit with its environment, its execution, and its predictability are the keys to its success. Organizations are encouraged to institutionalize best practices, freeze them into place, focus on execution, stick to their knitting, increase predictability, and get processes under control. These ideas establish stability as the key to performance.

Stability of a distinctive competitive advantage is a strong driver for organization design because of its expected link to excellence and effectiveness. Leveraging an advantage requires commitments that focus attention, resources, and investments to the chosen alternatives. In other words, competitive advantage results when enterprises finely hone their operations to perform in a particular way. This leads to large investments in operating technologies, structures, and ways of doing things. If such commitments are successful, they lead to a period of high performance

and a considerable amount of positive reinforcement. Financial markets reward stable competitive advantages and predictable streams of earnings: A commitment to alignment reflects a commitment to stability.

Consequently, enterprises are built to support stable strategies, organizational structures, and enduring value creations, not to vary. For example, the often-used strengths, weaknesses, opportunities, and threats (SWOT) analysis encourages the firm to leverage opportunities while avoiding weaknesses and threats. This alignment among positive and negative forces is implicitly assumed to remain constant, and there is no built-in assumption of agility. When environments are stable or at least predictable, enterprises are characterized by rules, norms, and systems that limit experimentation, control variation, and reward consistent performance. There are many checks and balances in place to ensure that the organization operates in the prescribed manner. Thus, to get the high performance they want, enterprises put in place practices they see as a good fit, without considering whether they can be changed and whether they will support changes in future, that is, by aligning themselves to achieve high performance today, enterprises often make it difficult to vary, so that they can have high performance tomorrow.

When the environment is changing slowly or predictably, these models are adequate. However, as the rate of change increases with increasing globalization, technological breakthroughs, associative alliances, and regulatory changes, enterprises have to look for greater agility, flexibility, and innovation from their companies. Instead of pursuing strategies, structures, and cultures that are designed to create long-term competitive advantages, companies must seek a string of temporary competitive advantages through an approach to organization design that assumes change is normal. With the advent of the Internet and the accompanying extended “virtual” market spaces, enterprises are now competing based on intangible assets such as identity, intellectual property, ability to attract and stick to customers, and, their ability to organize, reorganize frequently or organize differently in different areas depending on the need. Thus, the need for changes in management and organization is much more frequent, and, excellence is much more a function of possessing the ability to change. Enterprises need to be built around practices that encourage change, not thwart it. Instead of having to create change efforts, disrupt the status quo, or adapt to change, enterprises should be built-for-change.

To meet the conflicting objectives of performing well against the current set of environmental demands and changing themselves to face future

business environments, enterprises must engender two types of changes: The natural process of evolution, or what we will call strategic adjustments and strategic reorientations:

- a. Strategic adjustments involve the day-to-day tactical changes required to bring in new customers, make incremental improvements in products and services, and comply with regulatory requirements. This type of change helps fine-tune current strategies and structures to achieve short-term results; it is steady, incremental, and natural. This basic capability to evolve is essential if an enterprise is to survive to thrive.
- b. Strategic reorientation involves altering an existing strategy and, in some cases, adopting a new strategy. When the environment evolves or changes sufficiently, an enterprise must significantly adjust some elements of its strategy and the way it executes that strategy. More often than not, enterprises have to face a transformational change that involves not just a new strategy but a transformation of the business model that leads to new products, services, and customers, and requires markedly new competencies and capabilities. However, operationally all these changes can be seen as manifestations of the basic changes only differing in degrees and multiple dimensions.

Maintaining an agile enterprise is not a matter of searching for the strategy but continuously strategizing, not a matter of specifying an organization design but committing to a process of organizing, and not generating value but continuously improving the efficiency and effectiveness of the value generation process. It is a search for a series of temporary configurations that create short-term advantages. In turbulent environments, enterprises that string together a series of temporary but adequate competitive advantages will outperform enterprises that stick with one advantage for an extended period of time. The key issue for the built-for-change enterprise is orchestration, or coordinating the multiple changing subsystems to produce high levels of current enterprise performance.

Aspects of Agility

This section addresses the analytical side of agility or change proficiency of the enterprise. It highlights the fundamental principles that underlie an enterprise's ability to change, and indicate how to apply these principles in

real situations. It illustrates what it is that makes a business and any of its constituting systems easy to change.

Agility or change proficiency enables both efficiency programs (e.g., lean production) and transformation programs; if the enterprise is proficient at change, it can adapt to take advantage of an unpredictable opportunity, and can also counter the unpredictable threat. Agility can embrace semantics across the whole spectrum: It can capture cycle-time reduction with everything happening faster; it can build on lean production with high resource productivity; it can encompass mass customization with customer-responsive product variation; it can embrace virtual enterprise with streamlined supplier networks and opportunistic partnerships; it can echo reengineering with a process and transformation focus; it can demand a learning organization with systemic training and education. Being agile means being proficient at change. Agility allows an enterprise to do anything it wants to do whenever it wants to—or has to—do it. Thus, an agile enterprise can employ business process reengineering as a core competency when transformation is called for; it can hasten its conversion to lean production when greater efficiencies are useful; it can continue to succeed when constant innovation becomes the dominant competitive strategy. Agility can be wielded overtly as a business strategy as well as inherently as a sustainable-existence competency.

Agility derives from both the physical ability to act (change ability) and the intellectual ability to find appropriate things to act on (knowledge management). Agility can be expressed as the ability to manage and apply knowledge effectively, so that enterprise has the potential to thrive in a continuously changing and unpredictable business environment. Agility derives from two sources: An enterprise architecture that enables change and an organizational culture that facilitates change. The enterprise architecture that enables change is based on reusable elements that are reconfigurable in a scalable framework.

Agility is a core fundamental requirement of all enterprises. It was not an area of interest when environmental change was relatively slow and predictable. Now there is virtually no choice; enterprises must develop a conscious competency. Practically, all enterprises now need some method to assess their agility and determine whether it is sufficient or needs improvement. This section introduces techniques for characterizing, measuring, and comparing variability in all aspects of business and among different businesses.

Principles of Built-for-Change Systems

Christopher Alexander introduced the concept of patterns in the late 1970s in the field of architecture. A pattern describes a commonly occurring solution that generates decidedly successful outcomes.

A list of successful patterns for agile enterprises (and systems) in terms of their constituting elements or functions or components are as follows:

a. Reusable

Agility Pattern 1

Self-Contained Units (Components): *The components of agile enterprises are autonomous units cooperating toward a shared goal.*

Agility Pattern 2

Plug Compatibility: *The components of agile enterprises are reusable and multiply replicable, that is, depending on requirements multiple instances of the same component can be invoked concurrently.*

Agility Pattern 3

Facilitated Reuse: *The components of agile enterprises share well-defined interaction and interface standards, and can be inserted, removed, and replaced easily and noninvasively.*

b. Reconfigurable

Agility Pattern 4

Flat Interaction: *The components of agile enterprises communicate, coordinate, and cooperate with other components concurrently and in real-time sharing of current, complete, and consistent information on interactions with individual customers.*

Agility Pattern 5

Deferred Commitment: *The components of agile enterprises establish relationships with other components in the real term to enable deferment of customer commitment to as late a stage as possible within the sales cycle, coupled with the corresponding ability to postpone the point of product differentiation as close as possible to the point of purchase by the customer.*

Agility Pattern 6

Distributed Control and Information: *The components of agile enterprises are defined declaratively rather than procedurally; the network of components display the defining characteristics of any “small worlds” network, namely, local robustness and global accessibility.*

Agility Pattern 7

Self-organization: *The components of agile enterprises are self-aware and they interact with other components via on-the-fly integration, adjustment, or negotiation.*

c. Scalable

Agility Pattern 8

Evolving Standards (Framework): *The components of agile enterprises operate within predefined frameworks that standardize intercomponent communication and interaction, determine component compatibility, and evolve to accommodate old, current, and new components.*

Agility Pattern 9

Redundancy and Diversity: *The components of agile enterprises replicate components to provide the desired capacity, load balancing and performance, fault tolerance as well as variations on the basic component functionality and behavior.*

Agility Pattern 10

Elastic Capacity: *The components of agile enterprises enable dynamic utilization of additional or a reduced number of resources depending on the requirements.*

Framework for Change Proficiency

How do we measure enterprise agility? This section establishes a metric framework for proficiency at change; an enterprise's change proficiency may exist in one or more dimensions of change. And, these dimensions of change can form a structural framework for understanding current capabilities and setting strategic priorities for improvement: How does the agile enterprise know when it is improving its changeability, or losing ground? How does it know if it is less changeable than its competition? How does it set improvement targets? Thus, a practical measure of change proficiency is needed before we can talk meaningfully about getting more of it, or even getting some of it.

It must be highlighted that measuring change competency is generally not unidimensional, nor likely to result in an absolute and unequivocal comparative metric. Change proficiency has both reactive and proactive modes. Reactive change is opportunistic and responds to a situation that threatens viability. Proactive change is innovative and responds to a possibility for leadership. An enterprise sufficiently proficient at reactive

change, when prodded should be able to use that competency proactively and let others do the reacting.

Would it be proficient if a short-notice change was completed in the time required, but at a cost that eventually bankrupted the company? Or if the changed environment thereafter required the special wizardry and constant attention of a specific employee to keep it operational? Is it proficient if the change is virtually free and painless, but out-of-sync with market opportunity timing? Is it proficient if it can readily accommodate a broad latitude of change that is no longer needed, or too narrow for the latest challenges thrown at it by the business environment? Are we change proficient if we can accommodate any change that comes our way as long as it is within a narrow 10 percent of where we already are?

Therefore, change proficiency can be understood to be codetermined by four parameters:

- Time: A measure of elapsed time to complete a change (fairly objective)
- Cost: A measure of monetary cost incurred in a change (somewhat objective)
- Quality: A measure of prediction quality in meeting change time, cost, and specification targets robustly (somewhat subjective)
- Range: A measure of the latitude of possible change, typically defined and determined by mission or charter (fairly subjective)

Enhancing Enterprise Agility

e-Business Strategy

e-Business refers to an enterprise that has reengineered itself to conduct its business via the Internet and Web. Successful enterprises need to reconceptualize the very nature of their business.

As customers begin to buy via the Internet and enterprises rush to use the Internet to create new operational efficiencies, most enterprises seek to update their business strategies. Enterprises survey the changing environment and then modify their company strategies to accommodate these changes. This involves major changes in the way companies do business, including changes in marketing, sales, service, product delivery, and even manufacturing and inventory. Changed strategies will entail changed business processes that in turn imply changed software systems or better still, software systems that are changeable!

Business Process Reengineering (BPR)

Although, BPR has its roots in information technology (IT) management, it is basically a business initiative that has a major impact on the satisfaction of both the internal and external customer. Michael Hammer, who triggered the BPR revolution in 1990, considers BPR as a “radical change” for which IT is the key enabler. BPR can be broadly termed as *the rethinking and change of business processes to achieve dramatic improvements in the measures of performances such as cost, quality, service, and speed.*

Some of the principals advocated by Hammer are as follows:

- Organize around outputs, not tasks
- Put the decisions and control, and hence all relevant information, into the hands of the performer
- Have those who use the outputs of a process to perform the process, including the creation and processing of the relevant information
- The location of user, data, and process information should be immaterial; it should function as if all were in a centralized place

When perusing the above points it will become evident that the implementation of Enterprise Systems (ES) possess most of the characteristics mentioned.

The most important outcome of BPR has been viewing business activities as more than a collection of individual or even functional tasks; it has engendered the process-oriented view of business. However, BPR is different from quality management efforts like TQM, ISO 9000, and so on, that refer to programs and initiatives that emphasize bottom-up incremental improvements in existing work processes and outputs on a continuous basis. In contrast, BPR usually refers to dramatic top-down improvements through redesigned or completely new processes on a discrete basis. In the continuum of methodologies ranging from ISO 9000, TQM, ABM, and so on, at one end and BPR on the other, ES implementation definitely lies on the BPR side of the spectrum when it comes to corporate change management efforts.

Mobilizing Enterprise Processes

This strategy entails replacing the process or process segment under consideration by a mobile-enabled link. In the next subsection, we discuss an overview of business processes before discussing the characteristics of mobilized processes.

Mobility offers new opportunities to dramatically improve business models and processes and will ultimately provide new, streamlined business processes that never would have existed if not for this new phenomenon.

Extending Web to Wireless

The first step in the evolution of mobility is to extend the Web to wireless; this is also known as webifying. For the most part, business processes are minimally affected in this phase. The goal is to provide value-added services through mobility with minimal disruption to existing processes. An example might be creating a new company website accessible through Wireless Application Protocol (WAP) phones or Palm OS-based personal digital assistants (PDAs). Firms attain immediate value through realizing additional exposure and market presence, and customers realize value through additional services.

Extending Business Processes with Mobility

The next step in the evolution of mobility is to extend existing business processes. New opportunities to streamline company business processes emerge and evolve to produce new revenue opportunities. One example is the way that mobility extends business processes through a supply-chain optimization model. New business processes emerge through these new mechanisms that ultimately shorten the supply-chain cycle, thus minimizing error and maximizing efficiency and realizing the utmost customer satisfaction. Real-time tracking and alert mechanisms provide supply-chain monitors with the capability to monitor shipments and product line quality in ways that traditional business models were not capable of doing.

Enabling a Dynamic Business Model

The final phase in the evolution of mobility is the one that has only been touched upon in today's world. The unique attributes of mobility will provide new and exciting ways of managing processes and allow for efficiencies never before attainable. The convergence of wireless technologies with existing business models will result in fully dynamic business processes.

Network Enterprises

Agile companies produce the right product, at the right place, at the right time, at the right price for the right customer. As pointed out by Jagdish Sheth in these times of market change and turbulence, the half-life (i.e., the

time within which it loses currency by 50%) of customer knowledge is getting shorter and shorter. The difficult challenges facing businesses today require organizations to transition into flexible, agile structures that can respond to new market opportunities quickly with a minimum of new investment and risk.

As enterprises have experienced the need to be simultaneously efficient, flexible, responsive, and adaptive, they have turned increasingly to the network form of organization with the following characteristics:

- Networks rely more on market mechanisms rather than on administrative processes to manage resource flows. These mechanisms are not simple arms-length relationships usually associated with independently owned economic entities. Instead, to maintain the position within the network, members recognize their interdependence and are willing to share information, cooperate with each other, and customize their product or service.
- While a network of subcontractors has been common for many years, recently formed networks expect members to play a much more proactive role in improving the final product or service.
- Instead of holding all assets required to produce a given product or service in-house, networks use the collective assets of several firms located along the value chain.

The agile enterprise is composed of small, autonomous teams or subcontractors who work concurrently and reconfigure quickly to thrive in an unpredictable and rapidly changing customer environment. Each constituent has the full resources of the company or the value chain at its disposal and has a seamless information exchange between the lead enterprise and the virtual partners.

Thus, a network enterprise is a coalition of enterprises that work collectively and collaboratively to create value for the customers of a focal enterprise. Sometimes, the coalition is loosely connected, at other times, it is tightly defined, as in the relationship between Dell and its component suppliers. An enterprise network consists of a wide range of companies—suppliers, joint venture (JV) partners, contractors, distributors, franchisees, licensees, and so on—that contribute to the focal enterprise's creation and delivery of value to its customers. Each of these enterprises in turn will have their own enterprise networks focused around themselves. Thus, relationships between enterprises in

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the network both enable and constrain focal companies in the achievement of their goals. Therefore, liberating the potential value in customer relationships hinges on enterprises effectively managing their non-customer-network relationships.



Though they appear similar, there are fundamental differences between the agile and lean approaches for running a business. Lean production is, at heart, simply an enhancement of mass production methods, whereas agility implies breaking out of the mass production mold and into mass customization. Agility focuses on economies of scope rather than economies of scale, ideally serving ever-smaller niche markets—even quantities of one—without the high cost traditionally associated with customization. A key element of agility is an enterprise-wide view, whereas lean production is usually associated with the efficient use of resources on the operations floor.

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ISBN 978-1-4987-0597-4