

Enabling Next Generation e-Business Architectures: Balancing Integration and Flexibility for Managing Business Transformation

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Overview

The increasing complexity of Internet and Web technologies and their rapid evolution are imposing a Herculean challenge for information technology managers. They are expected to achieve optimal utilization of their existing information systems for business performance while ensuring integration of the latest Internet and Web technologies in their enterprise information and technology architectures. At the same time, they must meet the expectations of business managers who need to create and sustain innovative business value propositions to keep up with the changing competitive environment and customer needs.

In response, the technology infrastructure providers that have historically offered products and services for vendor-specific platforms are realigning their value propositions in terms of customer-oriented e-Business 'solutions'. The increasing realization of benefits for both providers and users in the adoption of private-labeled externally hosted and outsourced technology platforms has resulted in the recent enterprise software revolution. Plug-and-play capabilities of business enterprise software applications are now available from application service providers (ASPs) and e-Business Solution Providers (EBSPs) with more streamlined paths for upgrades, better user interfaces, and ease of systems integration and administration.

Such 'e-sourced' capabilities are not without their share of concerns about privacy, security and reliability, but they provide some comfort in dealing with the complexity of the latest technologies while ensuring their rapid adoption and adaptation. Most CIOs, CTOs and their technology managers will need to cope with the integration of new e-Business enterprise applications with the traditional brick-and-mortar information architectures and infrastructures. An increasingly greater need to integrate across extended inter-enterprise value chains and supply chains will demand better fusion of Enterprise Resource Planning (ERP) applications with Supply Chain Management (SCM) applications and Customer Relationship Management (CRM) applications. Such integration of inter-enterprise information value chains will not be possible without supporting integration standards, computing processing power, data storage capacity, and network bandwidth capacity.

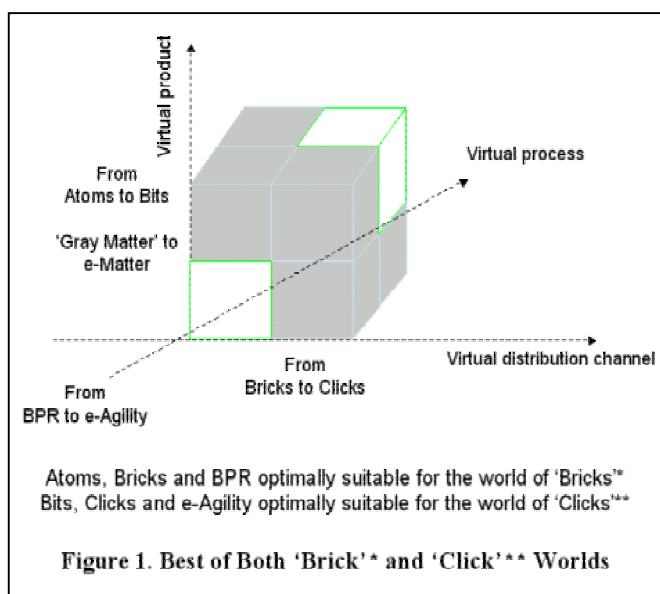
Not surprisingly, major technology infrastructure companies are realigning their product and service platforms into "e-Business solution architectures" that can better address the needs of improved integration and interoperability. Greater level of integration and interoperability is required not only across hardware, software, network and database components of the enterprise information architectures, but also across the diversity of technologies supporting inter-enterprise supply chains and extended value chains. Intel's major undertaking, the e-Business solutions architecture (<http://www.intel.com/eBusiness>), provides the design principles for services-oriented architecture and is expected to define the customer-oriented business value propositions and architectural directions for the next generation e-Business applications. As a founding

member of the Business Internet Consortium (<http://www.businessinternetconsortium.org/>), Intel leads its mission through advocacy of e-Business architectural directions, interoperable building blocks and common procedures that will be the basis for the next generation e-Business Internet development.

Intel recognizes that in addition to enabling the technology, a better understanding of organizational cultural issues and their strategic implications is critical to the successful implementation of e-Business technology architectures. This white paper is intended to contribute to an understanding of such issues as they relate to the successful implementations of e-Business technology architectures and infrastructures for business transformation. A better grasp of such issues by companies integrating the latest e-Business technologies within their business models as well as by their IT providers is crucial for meeting the expectations of performance of next generation e-Business solutions.

Business Transformation and e-Business Model Innovation

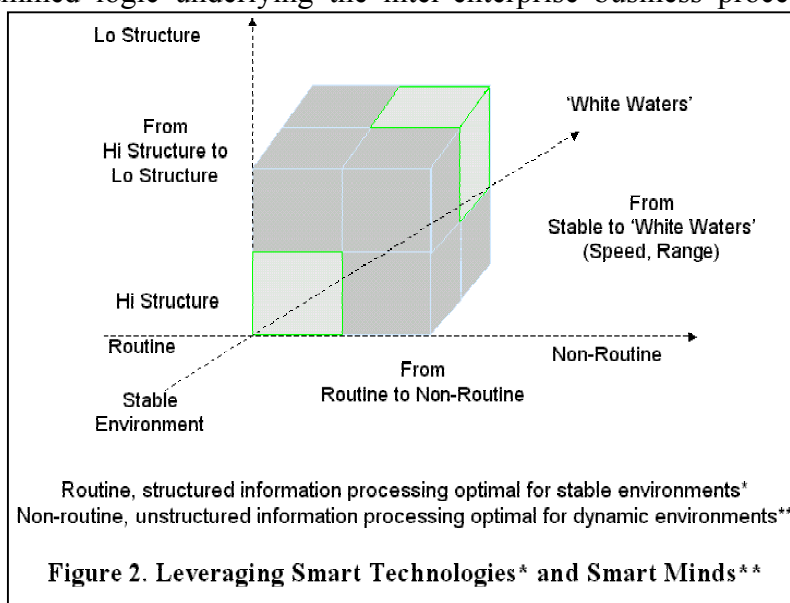
CEOs and top executives of companies investing in next generation e-Business platforms demand better justification for investments in e-Business technology infrastructures and the articulation of expected business performance outcomes. They also need to know how investments in new e-Business technology architectures and solutions would contribute to the adaptability of their businesses to unprecedented and rapid pace of change. Integration of information value chains is necessary across the supply and demand networks that compose the e-Business ecosystems. Simultaneously, there is growing need for balancing higher level of technology integration with agility and flexibility necessary for adapting and responding quickly to changing business needs. Resultant business models would preclude straitjacketing of the e-Business service architecture and business process architecture with increasing level of technology integration. They would also enable continuous refinement of the *business value propositions* driven by innovative and sustainable *customer value propositions*. Alignment of these two processes would provide the enterprise with the wherewithal for improved business *valuation* while ensuring sustainable *value creation*.



Only by attending to the fundamentals of *business model innovation* combined with innovative technology solutions can IT executives create viable e-Business enterprises. They would realize enterprise performance capabilities based on the best of *both* 'brick' and 'click' worlds by recognizing that neither is *inherently* superior or inferior, rather the overarching business model determines the success of the e-Business technology architecture. Schematic representation shown in Figure 1 indicates that successful business models could be located

anywhere along the three dimensions of products, processes and distribution channels as long as they enable innovative and viable customer value propositions. Technology executives who can relate to the bigger picture of Internet-enabled business transformation would be better positioned to take advantage of the next generation e-Business technologies. Certainly, better integration of e-Business technologies across inter-enterprise value networks is expected to result in faster information flows for faster feedback loops to affect business performance. But, a business environment characterized by rapid, radical and discontinuous change requires adaptive technologies *and* human creativity and sense making to work hand in hand.

While human sense making capabilities may *detect* changing patterns that may be difficult to discern otherwise, adaptive integrated e-Business technologies would facilitate real time adaptation to *correct* the programmed logic underlying the inter-enterprise business process architectures. The synergy of *smart technologies* and *smart minds* could yield improved business performance by *efficient* and *effective* detection of changing business patterns and by enabling an anticipative process of course correction as illustrated in Figure 2. The organizational cultural and strategic factors discussed in this white paper are expected to enable the development of insights to detect unpredicted changes in the business environment and respond more proactively with innovative customer value propositions and business value propositions.



In the past, data integration related to business processes has been often done with insignificant attention to adaptability of the business model and related business value propositions and customer value propositions. While providing for an unprecedented level of data sharing across internal business processes, many such ERP systems inadvertently straitjacketed the flexibility of the business model. Driven by the need for large-scale inter-enterprise business process integration, many such systems have evolved into extended enterprise application integration (EEAI) implementations, often subsuming customer relationship management systems and supply chain management systems. Despite technological advancements in integration of data and processes, often e-Business models have been found lacking in adaptability because technology implementations were done with little attention to the necessary organizational cultural and strategic enablers. Hence, architects of next generation e-Business enterprises must take a more holistic approach to designing inter- and intra-organizational “systems” with due consideration not only for the technological design, but also the design of organizational cultural and strategic enablers of these systems. By doing so they would realize that where ‘disruptive technologies’ *alone* failed, combined with ‘disruptive business value propositions’, same

technologies could provide the winning recipes for success. In most cases, such business value propositions would result by staying one step ahead of the customers' needs and coming up with brand-new product and service innovations to inspire their imaginations. Where *static* customer value propositions are eroded by dynamic changes in the competitive forces, agile enterprises would survive by avoiding battling for market share in an already crowded market and *commoditization* resulting from the 'me too' approach.

e-Business Technology Architectures for Pervasive e-Business

The next generation of e-Business marks the milestone beyond extended enterprise application integration. Given increasing focus on speed and flexibility, most business enterprises would depend upon external e-Business technology providers for plug-and-play technology capabilities to enable rapid deployment of e-Business models. Intel's vision for the next generation of e-Business depicts successful enterprises as going beyond accelerating, automating and optimizing their own business systems to delivering information to accelerate, automate and optimize the decision-making processes of their customers, suppliers and business partners. This would result in more machine-to-machine (M2M) transactions, examples of which include transactions that automatically check for availability of out-of-stock items with pre-authorized suppliers, place the most optimal combination of orders, and specify the modes of payments and shipment to expedite time for delivery while minimizing costs.

The next generation e-Business architecture will be characterized by independent, nimble connections and applications that can adapt and react when connections are added, removed, broken, and restored on the fly. Called the *balanced computing model* by Intel, it combines the best of server-centric, PC-centric, and network-centric models. In this model, high performance client systems are expected to offer improved personalization, adaptability and integration of user's needs with the vendor's services. These advances will offer greater flexibility for linking heterogeneous processes and systems across multiple customers that was missing in 2-tier, 3-tier, and n-tier application architectures. In Intel's e-Business solutions architecture vision, *customer's business needs* determine the need for evolution in the development and deployment of technology-enabled business applications.

The *technical architecture* defines the unique characteristics of the next generation solutions and has three core attributes – *compound applications*, *delivery mechanisms*, and, *loose coupling*. A customer's *compound applications* that integrate data local to the customer's business seamlessly with multiple, remote vendor services form the cornerstone of the next generation customer-centric e-Business. These applications contain embedded service interfaces from several other applications and thus allow assembly of business solutions. *Delivery mechanisms* describe the manner in which data is delivered through successive levels of complexity. *Loose coupling* of the business applications and vendors' service interfaces that provide specific functionality for those applications is necessary to accommodate vagaries resulting from temporary unavailability of the vendors' systems or Internet connections. Such *loosely coupled* applications are able to weather broken Internet connections, sluggish network performance, and other situations that result in temporary inaccessibility to vendor's systems. Loosely-coupling the services from the applications that integrate them ensures the applications continue to function properly even when

some of the supporting services are unavailable. This architecture also enables m-Commerce applications in which users can work offline and synchronize upon reconnection.

The next generation e-Business architecture advances beyond the current paradigm of E-Commerce to a pervasive e-Business model based upon "end-to-end" E-Business infrastructure built around information value chains and supply chains. It will be characterized by unprecedented scale and scope of integration at the level of e-Business technology architecture as well as at the level of e-Business service architecture. It will also need integration across diverse communication technologies to support intermittent connectivity based upon independent, nimble connections and applications that can adapt and react when connections are added, removed, broken, and restored on the fly. While the service architecture will be specific to the vendor-customer relationship, it will be supported by key technologies such as XML, XSLT, COM, Java, Enterprise Javabeans (EJB), and, CORBA.

Intel's next generation e-Business vision supports *peer-to-peer* (P2P) computing which is a logical extension of the balanced computing model. The key value proposition of P2P is the utilization of all the power of the computers and people at the edge of our networks, and the resulting value from intelligence and creativity at those edges. According to a report in January 2001 issue of the *Application Development Trends* magazine, most U.S. companies use less than 25% of their computing and storage capacity and 90% of their computing capacity is idle at some point during the day. By linking computers embedded in PCs, PDAs, Internet-enabled phones and any other Internet *devices* in a way that they can share resources, corporations will be able to minimize wasted 'computing cycles' and maximize hard disk space and computing memory utilization. Key challenges in widespread adoption of P2P relate to IT managers' concerns about lack of centralized management controls and related security threats. Intel's P2P Working Group (<http://www.peer-to-peerwg.org/>) is leading an industry effort to resolve some of these issues by defining standards and specifications to facilitate widespread adoption of P2P.

Given the customer-centric focus of the next generation of e-Business architectures, customers will play a key role in guiding business enterprises in defining the most valued customer value propositions. The next generation of e-Business would be characterized by greater involvement of the customer communities not only in the self-order process, but also in the product design and service processes - functions that have been traditionally supported internally. Empowered by the Net, they will not only stimulate the changes in pricing structures, distribution channels and design and delivery of products and services, but also collaborate to affect such changes. Customer-savvy companies are already paving the path for the next e-Business revolution by inviting proactive participation of customers in product design, R&D, and other activities, by turning their back-office information processes from the inside out.

Challenges of Balancing Integration and Agility

The greatest challenge for both e-Business technology providers and for companies using their technologies is to ensure that they are able to integrate new technologies with existing technology architectures while ensuring flexible and adaptable business models. As noted earlier, next generation e-Business technologies cannot be effective if implemented with little regard for the *vital aspects* related to organization, culture, strategy and management of the enterprise. Most

executives face the dilemma between risking obsolescence of their business models and value propositions and risking seven challenges that relate to these vital aspects critical for enterprise agility and adaptability. They must take a more holistic approach to designing inter- and intra-organizational “systems” with due consideration not only for the technological design, but also the design of organizational cultural and strategic enablers of these systems. This approach is expected to provide the balance of integration and flexibility required for the next generation e-Business architectures. The following discussion highlights how the seven challenges relate to the recent evolution in thinking about e-business strategy, process performance control, organizational culture, knowledge management, economics of increasing returns, structural e-business model innovation, and management for self-control.

Strategic Challenges of Next Generation e-Business

In an influential *Harvard Business Review* article, Brian Arthur, a professor at Stanford and a distinguished fellow at the Santa Fe Institute, described the emerging world of information-enabled business enterprises as a ‘world of re-everything.’ In this world of e-Business, corporate success will increasingly depend upon adapting the *programmed logic* of the enterprise in accord with the sustained dynamic and radical changes in the business environment. Hence, the traditional emphasis on the use of information technologies for automation of functions, rationalization of workflows, and redesign of business processes will be inadequate. Rather, most organizations will need to develop adaptive capacity for redefining their business value propositions inherent in their business models. Competitive survival and ongoing sustenance would primarily depend on the enterprise’s ability to continuously redefine and adapt organizational goals, purposes, and the organization’s “way of doing things.” The digital business models will need to accommodate relatively rapid obsolescence of traditional concepts of industries, organizations, products, services and channels of marketing, sales and distribution. The most innovative business models would alter, and redefine the structure of their industries just as Dell’s build-to-order supply chain management affected the economics of the desktop computer manufacturers. The critical challenge for most e-business enterprises will lie in redesigning their business processes to align with the business model needed for realizing new and more interesting customer value propositions.

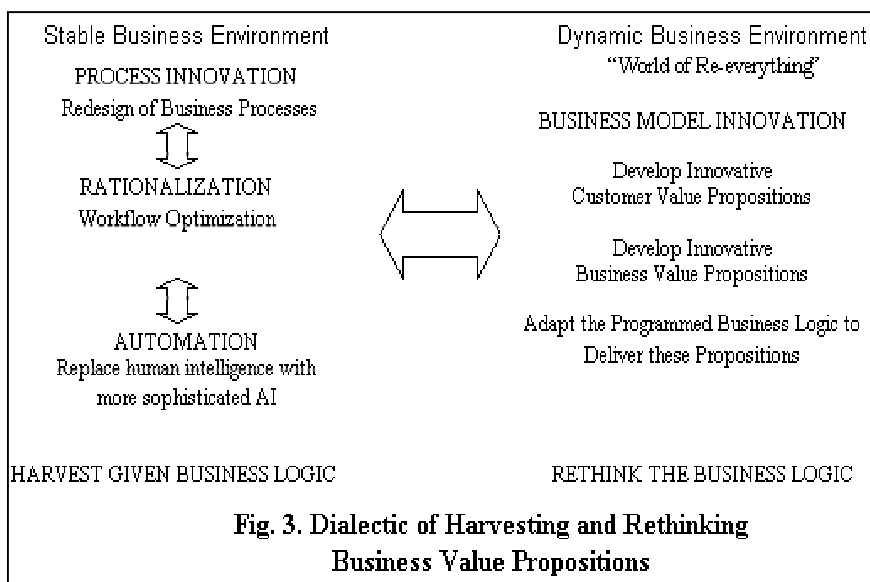
The next generation of e-Business architectures will need to accommodate the need for ongoing questioning of the programmed logic and very high level of adaptability to incorporate dynamic changes in their business and information architectures. Designers of information architectures will need to be adept at growing systems that can be readily adapted for delivering innovative customer value propositions and business value propositions. As e-Business moves to a greater level of integration with extended enterprise application integration (EEAI) across inter-enterprise value chains, IT designers will need to provide loose coupling between the e-Business technology architectures and the corresponding e-Business service architectures. While increasingly greater levels of integration will help in achieving more efficient optimization of information processes, there will be a critical need for ensuring that the programmed logic can be adapted easily to evolving definitions of business performance outcomes. Loose coupling of e-Business technology architectures and e-Business service architectures will ensure that the customer value propositions can be adapted without being unduly straitjacketed by the underlying state of technology. Similarly, given the increasingly componentized nature of

services provided by vendors, adaptation of underlying technologies would be feasible without adversely impacting the business performance outcomes. The new paradigm of flexible, adaptive and scalable systems will accommodate real time changes in information and data across the business ecosystems network. The technological systems will still depend upon the sense and respond capabilities of human counterparts for detection and correction of any discrepancies between the ‘theory of business’ and the radical changes in the business environment.

Control Challenges of Next Generation e-Business

Centralization of business strategy will need to be balanced with autonomy and self-control of employees as it is necessary for agility and flexibility of adaptation to ensure speedy execution. Control is often based on rules and hence difficult to maintain in a world where competitive survival often depends upon questioning existing assumptions. Most organizations will need to become comfortable with the *dialectic* of harvesting what they have already learnt and programmed in their business models *while* being able to rethink and redefine their current models of success before they are marginalized by changes in competitive forces.

From this perspective depicted in Figure 3, the undoing of once stellar e-Business success stories resulted more from erosion of their customer value propositions by dynamics of the competitive forces and less from any inherent problems with the ‘virtual form.’ In many such cases, ‘best practices’ derived from benchmarking against the ‘brick and mortar’ companies were adopted in absence of innovative customer value propositions and business value propositions based upon rethinking of fundamental assumptions.



Design of next generation e-Business architectures should ensure that they are not constrained by their overemphasis on consistency. While the traditional business logic was based on control, the dynamics of the new business environment require a business model that assumes existence of few rules, some specific information and a lot of freedom. Within the proposed model, the designers of organizational systems can at best facilitate the organization's 'self-designing'. In this organization design, not only would the organization's members define problems and generate their own solutions, the members would also evaluate and revise their solution-generating processes. By explicitly encouraging experimentation and rethinking of premises, this model promotes reflection-in-action, creation of new knowledge, and innovation.

The next generation of e-Business architectures will be built upon e-sourcing of related technologies and services. This will result in greater dependence of the enterprise upon its providers of enabling technologies and services. The more mission critical the business performance of these technologies and services, the greater will be their dependence upon external vendors. To some extent, the loss of control can be alleviated by using detailed service level agreements (SLAs) overseen by relationship managers responsible for ensuring fulfillment of promised services. However, most enterprises will need to carefully consider the backup options in case the specific technologies and services or the responsible vendor becomes inaccessible due to any reason.

Integration of data and processes across inter-enterprise value chains will also impose certain control challenges. On one hand, the players in the inter-enterprise supply chains and extended value chains will need to share information and collaborate with their upstream and downstream partners to ensure streamlined information flows. On the other hand, they may perceive the upstream and downstream players as potential competitors vying for the most attractive and dominant position in the value chain networks. While sharing of accurate information related to goods or services flowing across the supply chain will be necessary, it increases the peril inherent in the paradoxical roles of collaboration and competition adopted by various players.

Organizational Cultural Challenges of Next Generation e-Business

Success of the next generation e-Business models will depend upon integration of not only data and processes across inter-enterprise supply chains and value chains, but also integration of decision-making across inter-enterprise boundaries. Effectiveness of integrated information flows will depend upon the accuracy of information that is shared by diverse stakeholders across inter-enterprise boundaries. The challenge of information sharing will result from the potentially competitive nature of various enterprises across the value chains as access to privileged information may often determine the dominant position in the inter-enterprise value networks. Similarly, access to customer and supplier data residing in databases or networks that are hosted on the infrastructure of e-sourcing providers may pose increased privacy and security challenges. This is particularly important in situations where sharing of proprietary strategic or competitive information about customer or supplier relationships needs to be safeguarded from third parties. This issue will be particularly relevant if the vendor's knowledge of the company's customers or specific customer relationships may be used against the best interests of the company. There will be need for trusting the vendor(s), however, the basis for trust will need to go beyond a simple contractual agreement given the changing business environment.

Often, individuals may not willingly share information with their departmental peers, supervisors or with other departments, because they believe that what they know provides them with an inherent advantage in bargaining and negotiation. Despite the availability of most sophisticated 'knowledge sharing' technologies, such human concerns may often result in sharing of partial, inaccurate, or ambiguous information. Even more critical than the absence of information is the propensity of sharing inaccurate or ambiguous information because of competing interests that may not yield true integration of *information flows* despite very sophisticated integration of enabling information technologies. Integrated information flows depend upon motivation of people to share accurate information on a timely basis across intra-enterprise and inter-enterprise

information value chains. Motivation of employees, organizations, customers, and suppliers to share accurate and timely information is based on trust, despite the potential of use of information in unanticipated ways. This in turn depends upon the overriding inter-enterprise and intra-enterprise information sharing cultures. As community and commerce paradigms increasingly intermingle, e-Business enterprises will be challenged to inspire trust and motivation for sharing needed information with their stakeholders on which they may often have little control. Given the lack of these enabling factors, it will be almost impossible to ensure that accurate information is available for integration despite presence of technologies that can facilitate such integration.

Knowledge Challenges of Next Generation e-Business

Popular e-Business technology architectures have often considered digitized memory of the past as a reliable predictor of the future success of the enterprise. This premise is valid for a business environment characterized by routine and structured change that can be pre-determined, predicted and programmed in the digital logic of the business and in digital data warehouses driving that logic. e-Business architects should be careful in assuming that the same premise is applicable in scenarios characterized by non-routine and unstructured change. While the digitized logic and databases can facilitate real-time execution of the inter-enterprise information value chains, their efficacy depends upon real-time adaptation of underlying assumptions to continuously account for complex changes in the business environment. Often such changes cannot be recognized or corrected *automatically* by computerized systems as they cannot be *pre-programmed* to detect a future that is unpredictable. Hence, the agility and flexibility of the e-Business enterprise is dependent upon its capability of sensing complex patterns of change in business environments *and* using that information for adapting the digitized logic and databases to guide decision-making, actions, and resulting performance outcomes.

AI and expert systems based knowledge management technologies can deliver the right information to the right person at the right time if it is known in advance what the right information is, who the right person to use or apply that information would be, and, what would be the right time when that specific information would be needed. These premises are valid in business scenarios characterized by structured and routine information processing and are relevant to process automation, workflow rationalization, and business process reengineering. Detection of non-routine and unstructured change in business environment would still depend upon sense-making capabilities of executives and employees for correcting the computational logic of the business and the data it processes.

A related challenge lies in tapping the tacit knowledge of executives and employees for informing the computational logic embedded in the e-Business technology architectures. It may be possible to gather information about the decision-making logic and related information sources from human experts if such decisions are based on routine and structured information processing. AI and expert systems related technologies enable complex computation of specific and clearly defined domain expertise areas by compiling inferential logic derived from multiple domain experts. The challenge of 'scanning the human mind and its sense making capabilities' lies in the problem that most individuals may know more than they think they know. This is particularly true about their information processing and decision-making capabilities related to

non-routine and unstructured phenomena. The meaning making capacity of the human mind facilitates dynamic adaptation of tacit knowledge to new and unfamiliar situations that may not fit previously recognized *templates*. The same assemblage of data may evoke different responses from different people at different times or in different contexts. Hence, storing explicit *static* representations of individuals' tacit knowledge in technology databases and computer algorithms may not exactly represent capturing their *dynamic* sense making capabilities.

The knowledge management technologies that facilitate human interactions and communications - when implemented with due consideration for the sociological and behavioral factors - have the potential of addressing some of the concerns expressed above. Many recent industry surveys related to such technologies have confirmed that often the problems do not lie in technology, but in its effective appropriation and use by motivated and dedicated individuals who are empowered to question the status quo and are willing to share information. This issue is pertinent given that everyone having access to the same information and data sources may not be equally motivated to use these resources. Research studies have shown that despite availability of comprehensive reports and databases, many executives often make decisions based on interactions with colleagues who they think are knowledgeable about the issues at hand. Hence, due consideration must be given to leveraging the sense making capabilities of executives and employees to ensure that the programmed logic of the business enterprise keeps in sync with the dynamic and radical shifts in the business environment. New benchmarks in enterprise agility and flexibility could be attained given careful consideration of the above concerns in the design of next generation e-Business architectures based upon large-scale integration.

Economic Challenges of Next Generation e-Business

Increased digitization and virtualization of the organizational model would leverage increasing returns on digital assets and knowledge capital. Traditional organizations would be under increasing pressures to balance the diminishing returns of traditional factors of production and increasing returns of knowledge assets. Peter Drucker, among others, has argued that in the emerging economy, knowledge is the primary resource for individuals and for the economy overall. Land, labor, and capital - the economist's traditional factors of production - do not disappear, but they become secondary. Brian Arthur argues that the 'world of re-everything' will be characterized by *increasing returns* based on information and knowledge-based assets. The traditional factors of production are constrained by a threshold of scale and scope as every unit increase in land, labor, or capital results in diminishing returns on every incremental unit beyond that threshold. In contrast, information assets and knowledge capital seem to be governed by a different law of economic returns: investment in every additional unit of information or knowledge created and utilized could result in progressively higher returns. Besides other factors, this is attributed to the *externalities* of the network: the strength and utility of the network increases with increasing membership in the network. Similar observations are unraveling traditional accounting procedures that cannot account for new factors of production such as knowledge capital, intellectual capital, and intangible assets.

Greater realization of human capital and knowledge assets would depend upon better relationships to ensure smooth functioning of e-Business architectures. Accordingly, organizations trying to set up effective inter-enterprise value chains will need to understand the mechanics of co-opetition – the art and science of collaborating and competing at the same time

with their inter-enterprise value chain partners. While 'plug-and-play' technologies could enable rapid adaptability of integrated technology infrastructures, success of the outcomes will be still dependent upon sustained business relationships with collaborators as well as potential competitors. Designers of the next generation e-business architectures would need to understand how enterprise information architectures for intra- and inter-enterprise integration of business processes could enable relationship-building capabilities. This will facilitate sharing of accurate, complete, and timely information by stakeholders across inter-enterprise boundaries to achieve true integration of information flows. Understanding how information sharing occurs in emergent and self-designed communities of practice such as those supporting open-source technologies could perhaps facilitate this process.

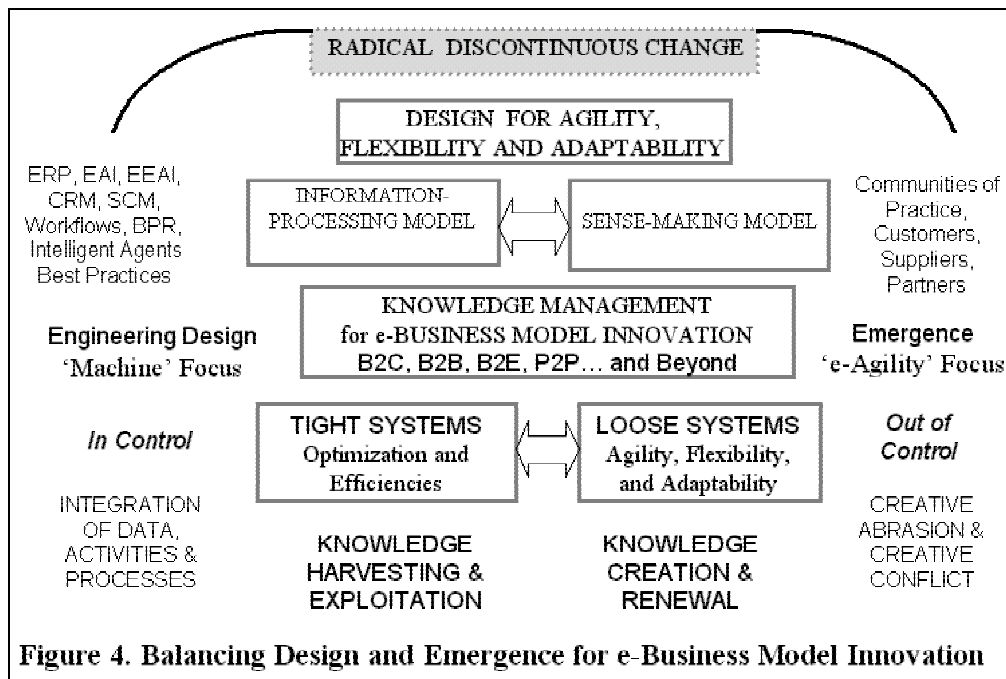
Many companies that have both formal and institutionalized information sharing capabilities as well as informal and ad hoc information sharing capabilities realize that *both* play important roles in their organizations. For instance, at PricewaterhouseCoopers, the formal and institutionalized KnowledgeCurve intranet has proven effective as a means for sharing routine and structured information relevant to worldwide employees, while the informal and ad hoc e-mail list, Kraken, has shown tremendous potential for hooking up “self-selected creatives” across various divisions and departments. It is important to realize that all information-sharing environments do not necessarily depend upon formal incentives, punishments and rewards. This is particularly true about information-sharing environments that *emerge* from self-selection of organizations and entities that cooperate with each other based on shared concerns despite the absence of formal controls, rewards or incentives. These issues will gain greater importance with the emergence of Internet based exchanges of knowledge, expertise, skills and intellectual capital in which employees can test the free market forces if they perceive that they are under-compensated in the formal employer-employee relationships. Enterprise managers will need to reconcile contractual measures such as punitive covenants with the need for trust and loyalty of customers, employees, partners, and suppliers that can only be achieved through *commitment* and not through *compliance*.

Structural Challenges of Next Generation e-Business

If not done carefully, large-scale integration of next generation e-Business technologies may result in greater centralization of decision-making. Organizational routines embedded in standard operating procedures and policies can become formalized as the firm's dominant business logic becomes reinforced by their implementation in computer programs and databases. Such formalized information systems become inflexible when they are based upon *static* assumptions about the business environment. With increasingly rapid, dynamic and non-linear changes in the business environment, such systems are increasingly vulnerable because of out-of-date assumptions inherent in their processing logic and the data processed by them. To overcome these vulnerabilities, it is necessary to design technological systems that are sensitive to the dynamic and divergent interpretations of information resulting from the changes in business environment. Subjecting the extant business logic to critique from diverse customer, supplier, and partner perspectives can help in defining innovative customer value propositions and business value propositions by quicker detection of complex changes in the business environment. Online and offline communities of customers, suppliers and partners could provide the means for enabling critical analysis of assumptions underlying the given business models.

The power of virtual online communities that serve as fountains of diverse viewpoints and innovative ideas can be exploited for generating stickiness and e-Business success as knowledge, relationships, and resources produced by online communities are valuable commodities. Expanded role of the customers, suppliers and partners includes their involvement in the creation of 'content', in generating product and service reviews, and in helping each other out on shared concerns. It is important to note that such roles assumed by the communities of customers, suppliers, and partners in the online world have been traditionally handled by internal customer service representatives or technical support personnel. Hence, in the emerging e-business models, virtual communities could be rightfully treated as external extensions of the company's service and support infrastructure.

It must be realized that developing an information-sharing technological infrastructure is an exercise in *engineering design*, whereas enabling use of that infrastructure for sharing high quality information and generating new knowledge is an exercise in *emergence*, as delineated in Figure 4. While the former process is characterized by pre-determination, pre-specification and pre-programming for knowledge harvesting and exploitation, the latter process is characterized by creation of organizational cultural infrastructure to enable continuous information sharing, knowledge renewal and creation of new knowledge.



Executives must understand the distinction between the lack of structure and lack of controls that characterize self-selected communities of practice (COPs) and the command and control systems embedded in their formal organizational structures. Such COPs may defy compliance seeking organizational tactics as they represent "self-organizing" ecosystems that require an organic management style in which a high degree of autonomy is ceded to members whose knowledge contributions cannot be controlled too directly. Greater involvement of communities of suppliers, customers, and empowered employees and contractors in the next generation e-Business models

would result in morphing of the command and control stereotypes underlying traditional organizational structures. As knowledge work gets dissipated across the boundaries of the organization, enterprise managers will need to become more comfortable with the model of the enterprise as dynamic 'anything, anywhere, anyhow' *structures* of people, processes, and technology networks.

Management Challenges of Next Generation e-Business

Traditionally, organizational controls tend to seek compliance to pre-defined goals that need to be achieved using pre-determined 'best practices' and standard operating procedures. Such organizational controls tend to *ensure* conformity by enforcing task definition, measurement and control, yet they may *inhibit* creativity and initiative. Given the premium on innovation of customer value propositions, business value propositions and business models, organizations in dynamically changing environments need to encourage experimentation. Design of new information architectures thus needs to take into consideration ambiguity, inconsistency, multiple perspectives, and impermanency of existing information. Such architectures need to be designed along the principles of flexible and adaptive information systems that facilitate exploitation of previous experiences, but ensure that memory of the past doesn't hinder ongoing experimentation and adaptation for the discontinuous future.

A key challenge for managers in the forthcoming turbulent environment will be cultivating *commitment* of knowledge workers to the organizational vision. As it becomes increasingly difficult to specify long-term goals and objectives, such commitment would facilitate real-time strategizing in accord with the organizational vision and its real time implementation on the frontlines. Knowledge workers would need to take autonomous roles of self-leadership and self-regulation as they would be best positioned to sense the dynamic changes in their immediate business environment. Compliance will lose its effectiveness as the managerial tool of control as managers removed from the frontlines would have less and less knowledge about the changing dynamics for efficient decision-making. Managers would need to facilitate the confidence of knowledge workers in acting on incomplete information, trusting their own judgments, and taking decisive actions for capturing increasingly shorter windows of opportunity. In the new world of business, the control over employees will be ultimately self-imposed.

Chris Argyris, the renowned management scholar and a professor at Harvard, has referred to the transition from traditional external control mechanisms to the paradigm of self-control as "the current revolution in management theory." Many new age scholars and practitioners are de-emphasizing the adherence to the "way things have *always* been done" so that such prevailing practices may be continuously assessed from multiple divergent perspectives. The explicit bias of *command and control* systems for seeking compliance makes these systems inadequate for motivating divergence-oriented interpretations that are necessary for ill-structured and complex environments. Systems designed to ensure compliance might ensure obedience to given rules, but they do not facilitate the detection and correction of errors. Hence, executives would need to adapt to the changing business environment by adopting a *sense and respond* approach to compensate for the inefficacy of the *command and control* model.

Summary and Recommendations For e-Business Executives

Intel's vision for the next generation e-Business architecture depicts successful enterprises as not only being able to *accelerate*, *automate* and *optimize* their own business systems but also related systems of their customers and suppliers. *Balanced computing*, *compound applications*, *loose coupling*, *distributed computing*, and networking technologies including P2P are expected to define the e-Business technology architecture of this vision. Intel recognizes that better understanding of organizational cultural issues and related strategic implications relevant to successful implementation of e-Business architectures and infrastructures is necessary for realizing the full leverage of technology solutions.

A business environment characterized by rapid and radical change puts a premium on continuous business model innovation to deliver novel, sustainable and competitively viable customer value propositions. Not surprisingly, top executives are demanding better justification for investments in e-Business technology infrastructures and expected business performance outcomes. They realize that the next generation e-Business models must be based on ongoing innovation of business value propositions and extended inter-enterprise value chains. Many of them want to know how investments in new e-Business technology architectures and solutions would contribute to the adaptability of their businesses to unprecedented and rapid pace of change.

In establishing the agenda for digitization of their enterprises, technology executives must recognize that their companies can create viable e-Business models only by attending to the fundamentals of agility and flexibility. The unprecedented level and scope of integration of information flows within and across enterprise boundaries has motivated design of architectures based on highly integrated technologies. As discussed here, most e-business implementations encounter seven challenges related to organizational cultural aspects of the enterprise with important strategic implications. To successfully manage these challenges, technology managers must take a holistic approach to designing inter- and intra-organizational "systems" with due consideration not only for the technological design, but also for the design of organizational cultural and strategic enablers of these systems. This approach is expected to provide the needed balance of integration and flexibility required for next generation e-Business architectures.

The architects of next generation e-Business enterprises cannot afford to treat strategic sustainability of business models, related organizational cultural challenges, and, dependence of these architectures on true integrated information flows as afterthoughts. Technology executives who are able to leverage the new e-Business technology architectures while considering them as part of the 'whole systems,' should be able to demonstrate that where 'disruptive technologies' *alone* fall short of expectations, they could provide the winning recipes for success when coupled with 'disruptive business value propositions'. By doing so, they will be able to develop e-Business architectures for agile and adaptive enterprises skilled in creating innovative business models driven by unique, interesting, and competitive customer value propositions.

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