

RUNNING HEAD: BUSINESS PROCESS MONITORING

Business Process Monitoring

Toward Enterprise Information Technology Commoditization

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Senior Project Research Seminar, Fall 2004

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13 December 2004

Abstract

Improved operations efficiency, achieved through technology-enabled modeling, automation, and correlation, advances IT's commoditization. Modeling reduces complexity, automation lowers operations expenditures, and correlated performance reports improve value perception. Its commoditization will gradually align IT closer with business and cause a labor-market shift.

Foreword and Introduction

Enterprise information technology (IT) is on the verge of a paradigm shift. Nicholas Carr (2003) alleged that IT is vital but no longer creates proprietary competitive gains. He contrasted its role as information-intermediary to railroad and electricity grids. IT is "infrastructure," he argued, and a ubiquitous "[factor] of production" (p. 6). IDC's¹ Picardi (cited by Kluth, 2004a) pointed out that corporations now spend more than three quarters of their IT budgets battling complexity and stabilization. This inefficiency deters innovation and usefulness. By comparison, the phonograph's evolution suggests that inevitably IT will *have* to become better manageable for administrators and function more transparently for users (Kluth, 2004b). As the technology becomes increasingly unobtrusive and usable, it transforms into a commodity².

This paper's intended audiences are practitioners in IT-related professions and their executive-management clients. I will first illustrate the objective of this study, which is to foster an understanding of *context-oriented systems management* and its potential to advance IT's transformation into a commodity. Next, I will formulate hypotheses and propositions to which the paper is subjected. Third, I will review literature lending itself to the discussion's context. Lastly, I will discuss survey and interview results.

Study Objective

Process and product innovation waves over a period of thirty years denote IT's evolution. The first wave, throughout the 1990's, raised worker productivity through pervasiveness and connectivity. Frameworks such as ITIL³ formalized operations⁴ procedures. Complexity became somewhat controllable through integration, and Chief Information Officers (CIO)⁵ optimized IT benefits (Feld and Stoddard, 2004). Yet, its inherent obscurity and substructure status hindered creating a favorable perception of IT. The second wave throughout the 2000's targeted cost, complexity, efficiency, and perception. CIO's consolidated⁶ and outsourced, improved integration and operations⁷, and refined the internal marketing of IT. The impending third wave introduces context-oriented systems management, causing three of IT's characteristics to mature. First, increasing standardization⁸ and automation will enhance operations efficiency. Second, closer alignment with business strategy will improve returns on investment (ROI). Third, added systems integration and enhanced data correlation will enable performance visibility. Two existing technologies establish the foundation for these improvements: traditional IT device monitoring and Business Activity Monitoring (BAM)⁹. Together, they form a new IT operations discipline: Business Process Monitoring (BPM)¹⁰. Its novelty is the advancement of IT operations through increased visibility and automation. BPM systematically interprets multi-source, incident-based monitoring data, and maps the information to the business' logical structure. Products that meet customer demand for "[correlation] *and* discovery" (Ferengul and O'Donnell, 2003) have already emerged¹¹.

To embrace BPM's potential, imagine two taxi drivers using street maps. One driver's regular map displays only the city center. The second driver uses an enhanced map, showing all boroughs. Moreover, it alerts to street closings, detours, and related traffic congestion on

surrounding streets. It does so automatically, visually, and in real-time. IT executives employing BPM share an advantage with the driver using the enhanced map. They navigate complex environments well, operate more efficiently, and have better information. Therefore, they can focus on what matters most: helping the business to generate profits.

IT professionals and executives take part in the transformation of IT. Though it is not widely proven in IT operations, BPM will soon affect these constituencies. For now, innovation remains swift, skills are in demand, and incomes appear secure. Eventually, this will change. Notable points of thought for CIO's for the future are cost management, understanding business needs, and ensuring operations continuity (Carr, 2003; Feld and Stoddard, 2004). Concerning the IT workforce, labor market adjustments similar to those attributed to past industrial mutations are probable. Standardization, automation, and assembly lines simplified labor in the early twentieth century (Hirschhorn, 1984¹²). More systematized and fragmented work processes disconnected people from the final product (Sabel, 1982¹³). The mechanization allowed replacing skilled with unskilled labor while productivity increased (Rutherford and Ahlgren, 1990¹⁴). BPM changes IT operations in a comparable manner. More sophisticated automated monitoring and alerting functionality¹⁵ supplemented with correlation intelligence shorten the time between incident occurrence and root-cause determination. The timesaving effect results from a programmed evaluation of incident data against business-impact models. BPM closes the gap between alert-delivery and problem-interpretation¹⁶. Since automation and intelligence reduce the need for analytical skill, two probable consequences arouse curiosity. Will expertise become less relevant? Will "deskilling" (Attewell, 1987, p. 324) degrade entire income groups?

Model, Hypotheses, and Proposition

Three questions guided the literature research: Is BPM an evolutionary step toward IT commoditization? Does it invite quality control issues due to its problem-detection abilities? Does it advance the repositioning of IT jobs? Figure 1 illustrates, from left to right, the forces influencing managers, workers, and IT suppliers. The model suggests relationships between these actors, the resulting intermediate outcomes in form of professional and personal objectives, and anticipated effects of BPM.

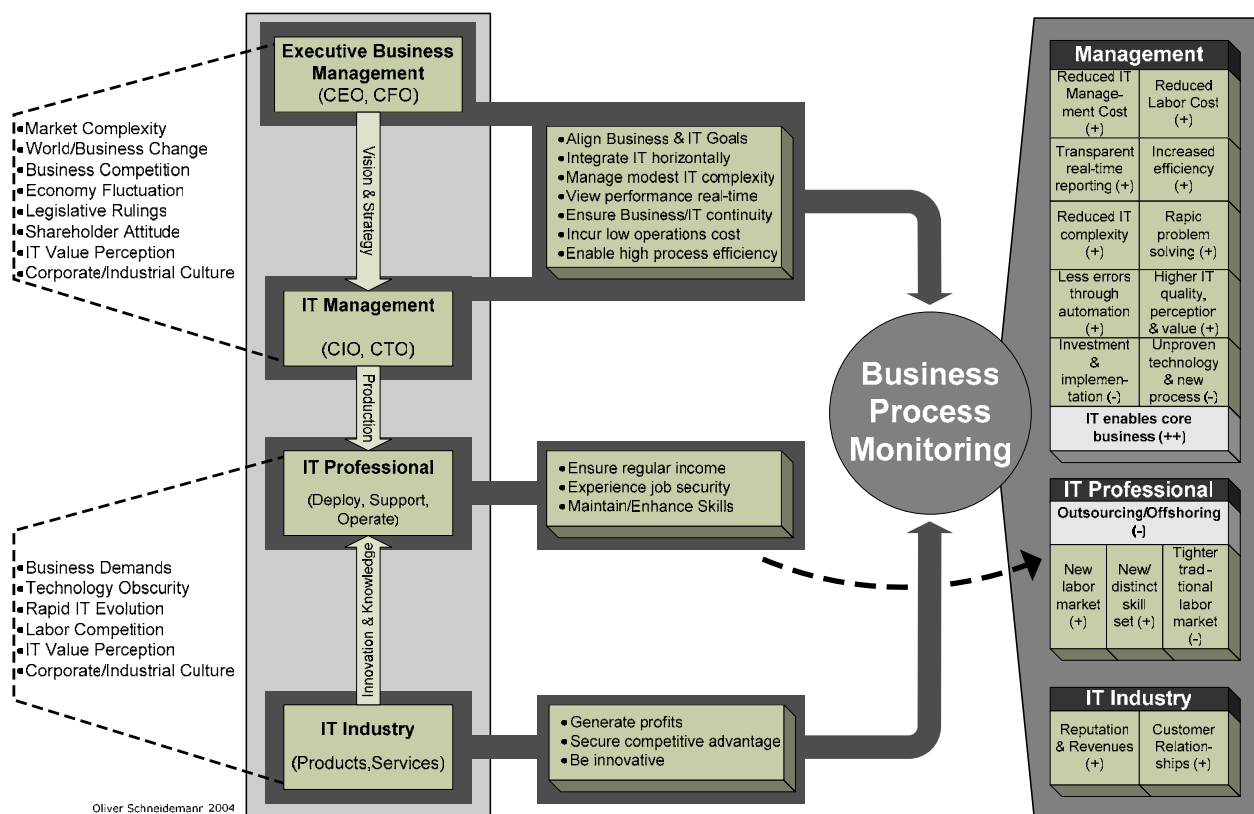


Figure 1: Actors, Outcomes, and Effects

For example, the CEO considers shareholder expectations during an economical downturn. Attitude concerning IT expenditures shifts toward increased efficiency, improved performance reporting, and reduced labor costs. To achieve these improvements, the CEO and CIO employ BPM to save labor costs, enable real-time performance reporting, increase

efficiency, and improve perception. IT professionals experience a labor market change or enhance their skills. Suppliers secure revenues and competitive advantage. The model exhibits two hypotheses:

1. Competition, legislation, change, and complexity influence executives. Thus, attitudes toward profits, information availability, productivity, and cost emerge.
2. Workers and suppliers are subjected to demand, evolution, and competition. As a result, attitudes toward knowledge, innovation, and income emerge.

This paper's proposition is that BPM optimizes IT operations efficiency through modeling, automation, and correlation¹⁷. Modeled integrated system views reduce IT complexity. Automation and expedited impact analysis based on the modeling increase stability and lower operations expenditures. Correlated real-time performance reports enable advanced IT value perception. BPM gradually aligns IT closer with business and causes a labor market shift¹⁸.

Literature Review

Journals that contributed literature reviewed for this paper include *Information Systems Management*, *International Journal of Project Management*, and *Management Review*. The *ACM*¹⁹ *Digital Library* supplied additional papers, conference proceedings, and surveys. Trade publications such as *Computerworld* yielded other relevant commentary. The research concentrated on business process, IT management and complexity, IT value perception, and IT performance evaluation.

Martins Shih and Tseng (1996) cited Davenport's business process definition and noted that managers "are interested in tracking ... resource commitment, ... productivity, ... flow of work, [and] information" (p. 374). Brock, Hendricks, Linnell, and Smith (2003) proposed that IT project success is possible using a "balanced model" (p. 4)²⁰. Peterson (2004) studied IT

governance and suggested that it involves horizontal alignment of IT management and business competencies. He concluded that governance is "based on collaboration, not control" (p. 21). Melville, Kraemer, and Gurbaxani (2004) reviewed "IT business value research" (p. 284) and contributed ten propositions explaining forces that affect IT value²¹. Hirschheim, Porra, and Parks (2003) studied IT performance and found that innovation caused the false belief that IT is not complex. A "perception gap" (p. 24) emerged²². Benamati and Lederer (1998) examined IT innovation and complexity tolerance. They pointed out that IT evolution "is causing difficulties for today's IT management" (p. 38)²³. Seddon, Graeser, and Willcocks (2002) surveyed IT managers and found that nearly 70 percent evaluated IT project practicability and progress. However, only 50 percent performed post-implementation reviews²⁴. Feld and Stoddard (2004) argued that three precepts are important for IT executives: long-term planning aligned with fundamental business objectives, deploying interoperable systems of nominal complexity, and embracing a culture that evaluates people and projects.

Seventy percent of executives surveyed by a consultancy thought that IT matters. However, "more than half felt that the lack of information or transaction capabilities [causes growth] bottlenecks" (New Bain & Company survey, 2004). McKinsey's Lohmeyer, Pogreb, and Robinson (2002) wrote about IT leadership and contended that accountability in particular "[improves] return on investment." Seely Brown and Hagel III (2003) suggested that adaptable IT design leads to "strategic advantage," since firms will "break free from the constraints ... and become capable of leveraging IT." Gartner's Mingay (2004) reported that firms employing ITIL experienced "improved productivity," reaped "[qualitative] benefits," and enabled cost savings. The Yankee Group's Kerravala (2002) wrote about "complex ... network elements, systems, and applications" (p. 2) and proposed an integrated perspective on heterogeneous environments

through "top-down infrastructure management" (p. 8-9). Gartner's Bill Gassmann (2004a) suggested that BAM enables firms to "operate their business as real-time enterprises." He also wrote, "BAM alerts people to useful business events ... through background processes that monitor key business performance indicators" and that "[additional] components ... [help] decide what to do about an incident" (Gassmann, 2004b).

Survey and Interview Results

One hundred Fortune 500 CIO's received an anonymous survey to confirm hypotheses and test proposition of this paper²⁵. It inquired about IT complexity and value perception, BPM objectives, and anticipated outcomes of its use. Due to the technology's novelty²⁶, it did not inquire about BPM success rates. The response rate was six percent. Four interviews with industry and technology experts generated additional viewpoints²⁷.

Thirty-three percent of CIO's surveyed rate the influence of IT complexity on their decision-making "Extremely Significant." They use BPM, believe that it improves revenues and business performance²⁸, and suggest that returns are added to profits (see Figure 2).

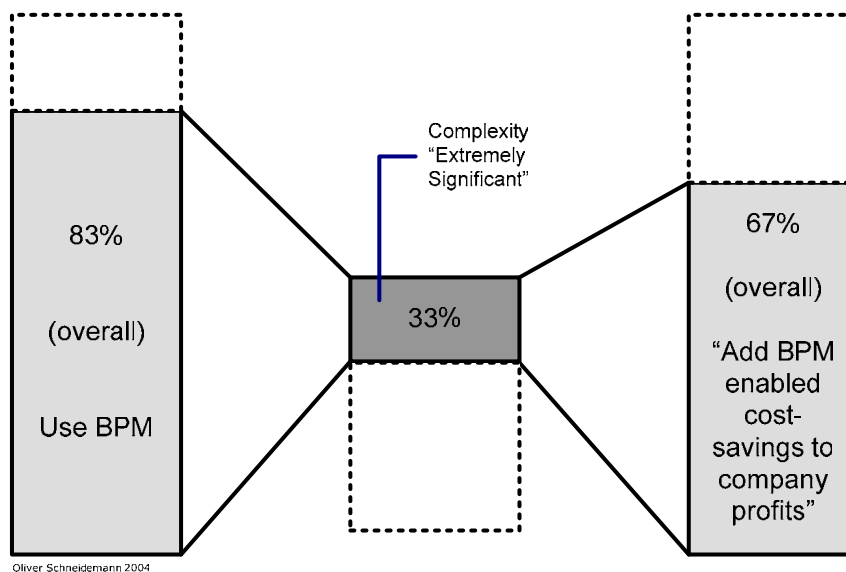


Figure 2: CIO Survey Responses

Fifty percent of the CIO's rate complexity "Moderately Significant" and two thirds of those use BPM²⁹. Table 1 illustrates that eighty-three percent of the responders thought that communicating IT value creates positive perception. Seventeen percent indicate the need to improve perception, and that they use BPM to promote IT value.

IT Value in Organizations

<ul style="list-style-type: none"> • Communicating IT value effectively creates positive perception 	<ul style="list-style-type: none"> • Actively "market" IT value; perception could be better
<p>83% (4/5 use BPM)</p>	<p>17%³⁰ (BPM used)</p>

Table 1: CIO Survey Responses

Figure 3 shows that of the CIO's in the survey who use BPM, the majority associate complexity management and automation objectives with it.

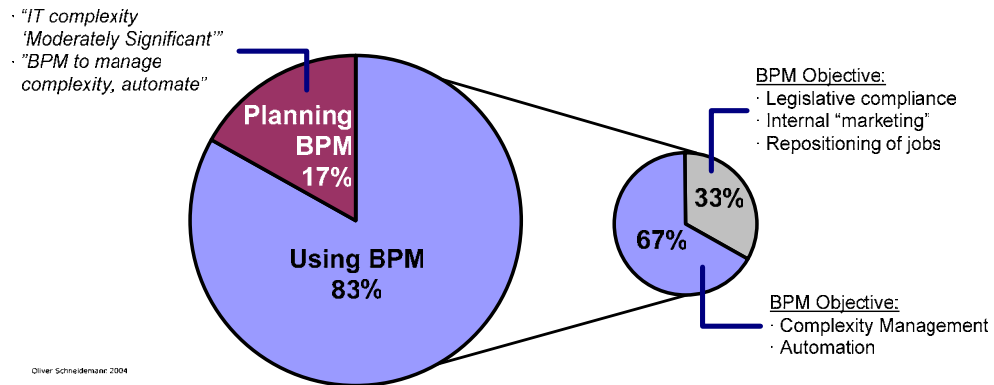


Figure 3: CIO Survey Responses

Figure 4 on page 10 depicts that of the CIO's who believe that BPM-enabled revenue increases would be added to profits, most use BPM. Not one CIO in the survey suggests investing these funds into business development or human capital, and only one third propose investing in IT innovation.

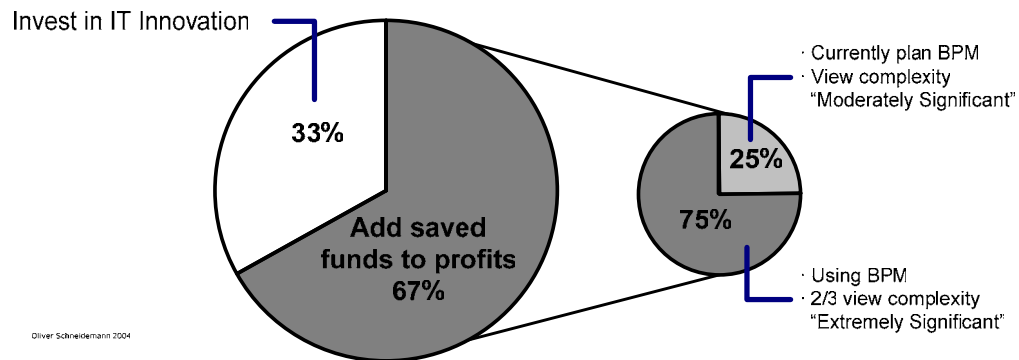


Figure 4: CIO Survey Responses

CIO's responses concerning success factors when balancing operations costs and innovation-enabling investments indicate that many believe in the significance of communication skills and a good rapport with other executives. IT's adaptability to changing business conditions is mentioned as an important factor, too.

Beth Gold-Bernstein³¹ (Personal communication, November 10, 2004) points out that BAM reduces personnel cost and operations error rates, and that it is used for compliance³². Firms model the business, automate transactions, and enable real-time performance- and transaction-visibility. She does not view BPM as an IT commoditization-enabler. According to her, Business Process *Management* involves "million-dollar implementation projects" that occur at a higher level than IT operations. Hence, Business Process Management and -Modeling are more significant for core business processes, not at the IT operations layer. The technology is positioned at the executive level and provides data for "information and intelligence," Gold-Bernstein explains. She also notes that business and IT alignment is "a huge issue, currently."

One analyst of an IT research firm³³ (Personal communication, November 16, 2004) rates IT complexity "Extremely Significant" for CIO's. This analyst believes that firms should do more to create value and improve perception. Objectives associated with BPM are complexity

management, improved systems uptime, and business operations management. Outcomes envisioned for firms using BPM are increased revenues, better business performance, and quality issues. This responder thought that BPM-enabled cost savings should be invested into business growth and IT innovation.

Nicholas Carr (Personal communication, November 24, 2004) believes that BPM is new and unproven. Managing complexity (which he rates "Very Significant" for CIO's), enabling automation, and increasing IT's transparency were suggested BPM objectives. He thinks that firms could do more to improve IT value and perception, and that potential BPM-enabled cost savings should be added to profits. He believes that misconceptions of IT's "strategic value," ignorance of IT tactics employed by competitors, and the "failure to take full advantage of [the] commoditization trend" affect CIO's in their quest to align IT and business.

Gartner's David McCoy (Personal communication, November 29, 2004) notes that IT complexity is a concern for corporations. He observes that managing "agile" infrastructure is getting increasingly complicated. McCoy also thinks that CIO's have caused a value perception-gap, because they "are not doing enough" to "prove" the value of IT. Tight budgets and meager trust in IT from business executives (who occasionally lack IT insights) are obstacles. Yet, CIO's do "not articulate IT well" and have few results to show when projects fail. He suggests three success factors for CIO's: having a solid technology background, "taking risks" without having "seen a case study first," and recognizing that they must prove IT value "over and over again."

McCoy agrees that a labor-market shift is a plausible consequence of BPM³⁴. Traditional technology objectives currently evolve toward emphasizing business-process management. Thus, IT professionals who adjust could take advantage of new career paths when they navigate business terms and processes with confidence. IT and business could align closer through BPM

and "gradual change" if it is "done right," McCoy explains. He reasons that eliminating an intermediary makes the "channel" or service provided "more effective." However, such change could introduce "opportunity for erosion." McCoy considers it a possibility that system designers introduce quality issues when they "subconsciously" calculate that BPM identifies flaws in new IT³⁵. Regarding cost-savings potential resulting from BPM, McCoy thinks that shareholder focus likely directs those funds toward company profits. He believes, however, that investment in human capital has merit, since there is "no compliance without training."

Analysis and Implications

IT enables worker productivity, manages transactions, and delivers information. Since the 1980's, firms have increasingly depended on it to achieve business objectives. Yet its swift adoption and progressive nature (i.e., Moore's law) made it increasingly difficult to manage IT. Moreover, climbing expenditures multiplied systems complexity, which led to escalating operations costs. Standardization and systems management improvements devised thus far have mitigated complexity and cost, but have only created an artificial sense of maturity. Considerable manual background effort not visible to the user is still necessary to run and maintain IT. Consider automobiles in comparison: they required abundant interaction with oil supply and choke throughout their infancy (Kluth, 2004b). Today's cars require minimal effort and allow focus on driving. BPM's automation features will change IT in exactly the same way.

Survey replies suggest that CIO's are acting to improve IT value. They understand that efficiency must increase to create business impact. The tendency toward adding cost savings to profits is not surprising due to the usual focus on shareholder value³⁶. Although automation-enabled labor-cost reduction contributes to profits, only one CIO chose job repositioning as a BPM goal. Media portraits of job-exporting firms³⁷ may cause reluctance to select this answer.

Whether BPM leads to quality issues could not be determined satisfyingly through the survey. Theoretically, system developers could perceive it as a safety net and reduce quality efforts. Yet the opposite outcome is as likely: BPM's enhanced detection abilities could motivate to improve quality³⁸. Table 2 shows consolidated survey and interview responses:

Response Overview

	Complexity is factor	Value and perception important	BPM helps with IT cost	IT alignment with business important	Labor market shift through BPM
CIO's	³⁹		⁴⁰	⁴¹	
Gold-Bernstein	n/a				n/a
'Analyst'					
Carr			⁴²	⁴³	
McCoy			n/a ⁴⁴		

Legend: ● More relevance ○ No relevance n/a = No Answer

Table 2: Consolidated Overview of Responses

A better understanding is required of the labor market shift's long-term socio-economic consequences resulting from IT's commoditization. Mason, McKenney, and Copeland (1997) cautioned that IT professionals ought to understand their vocations' history and consequences for society⁴⁵. Since context-oriented systems management advances automation, which eliminates jobs and is an accessory to offshoring⁴⁶, labor changes affecting society are certain⁴⁷. Edwards (2004) noted that, historically viewed, employment eliminated in one area of an economy resurfaced in a new trade or industry. He thought that jobs not envisioned a century ago exist today, and that new demand will lead to "many more tomorrow."⁴⁸ The economist Joseph Schumpeter wrote comparably of "creative destruction" (cited in Mason et al, 1997), in which the establishment of new economic structures follows structural losses caused by change. Hence,

stigmatizing outcomes of change as good or bad would be shortsighted. The CIO's survey responses suggest that employment repositioning and new career paths in combination will change the IT workforce. Additional research should attempt explaining a dilemma caused by the proposed value of saved labor cost and the reinvestment of such funds. If scarce investments into human capital result in quality issues, how could service management improve in harmony with layoffs? In which professions could the vacant labor become useful? Moreover, are there hidden opportunity costs of the labor-market change?

Baily and Farrell (2004) stated that offshoring generates \$1.14 in return for every dollar of a U.S. firm's expenditures sent to India. They asserted that it "[keeps] companies profitable" and secures domestic employment. They also suggested that adaptability allows jobs to be re-created faster than offshoring eliminates them and cited a BLS⁴⁹ report estimating 22 million new jobs in "business services, health care, social services, transportation, and communications" by the year 2010. Baily and Farrell did acknowledge that "[a] sizable portion of the workers who lose their jobs ... don't find new ones easily or must accept jobs with lower wages." IT's evolution could result in harsh socio-economic consequences. When unsophisticated work substitutes for lost jobs and earns only low wages, people move downward from their income-range category. Accordingly, they face difficulties maintaining their life standard. There exists recent precedence for this phenomenon: because a U.S. retailer paid mostly low wages, social costs shifted to the public (Miller, 2004).

Conclusion

In this paper, I reviewed the evolving potential of context-oriented systems management. The ability to reduce complexity, lower expenditures, and establish accurate value perception optimizes IT operations effectiveness. Unobtrusiveness arises and IT transforms into a

commodity. The technology aligns closer with business and enables focus on strategic objectives. Structural labor market changes result from IT's commoditization, too.

Additional conclusions can be drawn from the research. New technologies and labor needs result in implications for IT professionals and their executive-management clients. Firms should pursue situational approaches when adjusting business structures. Standardized strategies are deficient when diverse environments influence business process models. In addition, labor transitions from declining to emerging sectors require changes in literacy. Tallman and Wang (1992) suggested "investments in support of human capital formation" to enable growth. Thus, firms opt for sustainability⁵⁰ or short-term profits. Preferably, they reinvest funds saved through the commoditization of IT in human capital and business development. Corporate responsibility also necessitates a changing attitude toward shareholder value and includes studying *all* socio-economic consequences of business decisions. IT professionals, on the other hand, should embrace that changes happen swiftly in a worldwide economy. Globalization and telecommunication have eliminated geography as a barrier affecting labor distribution. The dimension of labor market shifts will vary between nations⁵¹. However, relocating has no merit since the interference of local conditions only delays adjustments. IT specialists with unique skill sets or who perform work requiring physical presence⁵² will continue to experience demand. Design and integration, for example, will remain mostly manual and unlikely move offshore (Baily & Farrell, 2004)⁵³. Employees should enhance their skills through education and learn the language of business. Others might prefer working with people⁵⁴ to working with machines and depart from IT. Whether there will be a fourth IT innovation wave remains speculation. Soon technology might solve issues without human interaction⁵⁵. Such intellect would refute Carr's argument that IT is like the railroad and electricity.

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Glossary

BAM *Business Activity Monitoring*

Surveillance of business processes and systems. Enables alerts when specific events are observed. BAM constitutes products *and* processes.

"(BAM) is a key combination of technology and process that must be deployed by enterprises seeking to operate their businesses as real-time enterprises (RTEs). In an RTE, decisions and actions are triggered by alerts, which are events with context. The BAM system is responsible for generating alerts that represent predefined conditions that warrant attention" (Gassmann, 2004a).

BPM *Business Performance Management*

Measuring business effectiveness and efficiency against performance metrics, for example in the areas of financial performance, customer relationship management, corporate processes efficiency, and adaptability for change and expansion. Adapted from: Basu, R. (2001). New criteria of performance management: A transition from enterprise to collaborative supply chain [Electronic Version]. *Measuring Business Excellence*, 5(4), 7-12.

Business Process Management

The study of business flow through modeling, monitoring, and refinement in order to enable a firm's objectives.

"Business process orchestration" (April and Margulius, 2002).

"The modelling [sic] of innovative processes aims ... at the process structures along the chain of appreciation of the firm." Zinser, S., Baumgartner, A., Walliser, F.-S. (1998). Best practice in reengineering: a successful example of the Porsche research and development center [Electronic Version]. *Business Process Management Journal*, 4(2), 154.

Business Process Modeling

Using a simplified view of multifaceted organization structures and process flows to explain, plan, or predict behavior.

"... a static structured approach to business improvement, providing a 'holistic' perspective on how the business operates, and provides a means of documenting the business processes while BPS [Business Process Simulation] allows management to study the dynamics of the business and consider the effects of changes without risk." Barber, K. D., Dewhurst, F. W., Burns, R. L. D. H., Rogers, J. B. B. (2003). Business-process modelling [sic] and simulation for manufacturing management: A practical way forward [Electronic Version]. *Business Process Management Journal*, 9(4), 527-542.

Business Process Monitoring → See BAM

BSC *Balanced Scorecard*

Devised by Kaplan and Norton, BSC focuses on four business perspectives: financial, customer, internal process, and learning and growth. It provides a set of guidelines for management and performance assessment. Adapted from: Marr, B., Adams, C. (2004). The balanced scorecard and intangible assets: similar ideas, unaligned concepts [Electronic Version]. *Measuring Business Excellence*. 8(3), 18-27.

ITIL *Information Technology Infrastructure Library*

A process framework for IT operations management.
"ITIL (IT Infrastructure Library) is the most widely accepted approach to IT Service Management in the world. ITIL provides a cohesive set of best practice, drawn from the public and private sectors internationally. It is supported by a comprehensive qualification scheme, accredited training organisations [sic], and implementation and assessment tools." Source: <http://www.itil.co.uk>.

KPI *Key Performance Indicator*

Sets of thresholds defined for business activities, including IT projects and systems. KPIs are used to measure performance of the activity or project. Adapted from: Bennington, P., Baccarini, D. (2004). Project benefits management in IT projects-An Australian perspective [Electronic version]. *Project Management Journal*. 35(2), 20-30.

Moore's Law *Technology innovation leading to better system performance through expeditious improvement-lifecycles*

Moore predicted in the 1960s "that transistor density on integrated circuits doubles about every two years." Higher density leads to more capacity and thus to better performance. PC's microprocessors are integrated circuits. Source: <http://www.intel.com/labs/eml>. This "law" held true for the most part. It became a popular expression for lifecycles of technological innovation of a variety of IT components, when speed, performance, and/or capacity improved.

Outsourcing *Purchasing services that execute business process at a lower cost*

"[Procuring] of services or products from an outside supplier or manufacturer in order to cut costs." NMA OUTSOURCING: What is outsourcing? [Electronic version]. (2004, October 28). *New Media Age*. London, S4.

Offshoring *Executing business process in a different location while exploiting cost and/or or productivity advantages*

"... offshore outsourcing [happens when] ... a customer hires [a] ... supplier to provide what it previously ran onshore." Offshoring explained [Electronic version]. (2003, June 23). *The Lawyer*. London, 20.

ROI *Return on Investment*

Assessment of investments, e.g. into information technology, and whether they paid back in measurable productivity increases and/or profits.

"Classical financial analysis of ROI is reported as a ratio and is a measure of an investment's performance.² [sic] It's calculated by dividing the return-the money earned during the time period-by the average investment-the average amount invested over the time period ... Investment evaluation involves quantifying savings and expenditures." Contino, D. S. (2004). What's your project's ROI? [Electronic version]. *Nursing Management*. 35, 21-23.

SQL *Structured Query Language*

Query language used in many current database products. Applications send SQL commands to search for information in the database. The server returns the results or a message. SQL's benefit is that only data traverse the network (as opposed to loading forms *and* data). Vendors in this segment are, for example, Oracle and Microsoft.

TCP/IP *Transmission Core Protocol, Internet Protocol*

Internet standard. It facilitates the transportation of information throughout the Internet. It compares to a language (protocol), allowing computer systems to exchange information. TCP ensures proper connectivity between systems and IP carries the information.

XML *Extensible Markup Language*

XML is an Internet standard used to integrate diverse information systems and enable communication, process, or data exchange. The protocol enables a common language between systems.

"Extensible Markup Language, abbreviated XML, describes a class of data objects called XML documents and partially describes the behavior of computer programs which process them." Source: <http://www.w3.org/TR/REC-xml>.

End Notes

¹ IDC, International Data Corporation. A technology think-tank and research firm. See <http://www.idc.com>.

² The Oxford dictionary explains a commodity as having an attribute of "[convenient] access to or supply of [it]." IT is already pervasive, though not yet mature (Feld, 2003). In this context, commoditization symbolizes 'unobtrusiveness'.

³ ITIL (Information Technology Infrastructure Library) is a process framework suggesting best practices to optimize IT operations and infrastructure management. Great Britain's Office of Government Commerce (OGC) devised ITIL. See <http://www.ogc.gov.uk>.

⁴ IT operations includes infrastructure management and support (i.e. setup/deployment of hard- & software, maintenance of all components in a heterogeneous environment, and operations of backend and front-end systems).

⁵ Firms use varieties of titles: CIO, CTO (Chief Technology Officer), COO (Chief Operations Officer). CIO will be used throughout this paper referring to the highest-ranking executive overseeing IT.

⁶ Server and application consolidation, for example.

⁷ For example, industry standards such as SQL, XML, and TCP/IP expedited integration. Improved device monitoring and alerting reported problems requiring intervention by operations specialists.

⁸ Feld and Stoddard (2004), for example, discussed benefits of standardization when "Silo Architecture" is eliminated.

⁹ IT device monitoring is realized with products, for example, from IBM (Tivoli) or Hewlett-Packard (Open View). Gartner, Inc., a technology think-tank and consultancy, created the term 'BAM', describing a framework that enables monitoring and interpretation of business processes and events (Schwartz, 2004). Anthes (2003) noted that such methodologies have been used for some time and pointed to fraud activity surveillance and risk management systems used by financial companies.

¹⁰ The interchangeable use of keywords became apparent during research. BPM emerged as the common acronym referring to the use of BAM technologies in IT operations. Consequently, this paper treats BAM and BPM as conceptually identical frameworks. A definition of BAM methodologies can be derived from the following sources. April and Margulius (2002) explained that BAM complements Business Process Management, allowing to manage "application transactions ... across distributed systems." Erlanger (2004) elaborated: "Live ... monitoring of business processes and KPIs ... is precisely the mission of BAM, which typically pulls information from a variety of applications and data sources then presents it to the user... BAM also filters the information it monitors based on user-defined business rules, sending out alerts when key thresholds are reached" (p. 44). Others also did not significantly distinguish BAM and BPM. Gold-Bernstein (2004), for example, wrote "[The] BPM acronym stands for ... business process monitoring (which refers to the real time visibility into business processes, also called business activity monitoring (BAM) to distinguish it from BPM)...". Poirier et al (2003) wrote "Business process monitoring: Once the processes were mapped and integrated ... business users [were enabled] to view the state of the processes on Web-based displays. ... These views unify previously unrelated fault, health status, availability, and performance data ... and allow business and IT managers to view and manage the enterprise as a consistent structure of business processes, services, applications, databases, servers, networks, etc." The functions attributed to BAM are BPM's value propositions, too. In other words, BPM is an outgrowth of BAM (see Figure 5).

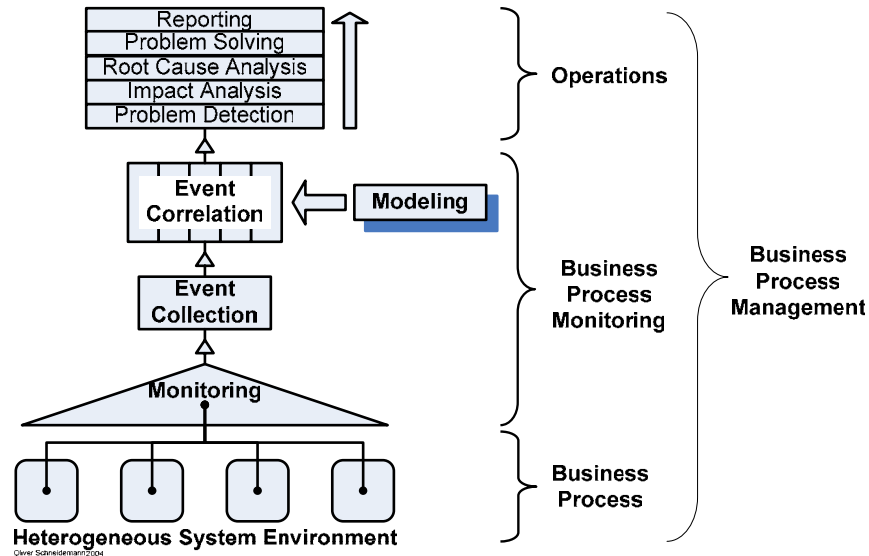


Figure 5: Business Process Management Representation (IT view)

¹¹ Discovery: detection of IT systems events. For example, in case a data telecommunications link connecting two campuses became unavailable, "detection" alerts IT professionals. Problem solving is instituted to determine the root cause of the unavailability, and measures to re-establish the link or provide a backup-link implemented. Related to "Discovery" is "Aggregation." Current monitoring products, such as Tivoli, already use event aggregation to manage multiple alerts from the same source. Correlation should not be confused with aggregation, as it has a different objective. Referring to the previous scenario, the likely impact of this link unavailability is also felt by an application user who is sending information between the two campuses (e.g., when the user in location A accesses a data store in location B). Conceivably, a separate report may alert to a problem on the application layer after the data link became unavailable. Correlation of the two incidents (data link unavailable and the resulting application problem) causes more transparency in respect to the true source of the issue. Correlation, as Ferengul and O'Donnell (2003) pointed out, consolidates data from multiple sources into one view.

¹² Hirschhorn (1984) wrote "The assembly line illustrates the fundamental principles of mechanization: standardization, continuity, constraint, and the reduction of work to simple labor. Taken together, these principles form the core of an industrial culture" (p. 14-15). "Constraint" referred to "constrained movement" (p. 11). He suggested that sequence and the breakdown of the work into smaller steps required timing, completeness, and quality. Otherwise, the line would turnout deficient final pieces. "Constraint" became inherent due to the strictness and limitedness in each production step. He warned also that work simplification causes "[lost] experiences and potentials ... as intelligent people are robbed of their ability to think, puzzle out, and discover" (p. 13).

¹³ Sabel (1982) noted that standardization and automation led to "routinization" (p. 33) in Henry Ford's factory.

¹⁴ Rutherford and Ahlgren (1990) pointed to the connection between mechanization, a reduced need for skilled labor, and increased productivity (pp. 151-152).

¹⁵ Enabled through ongoing product-refinements in current monitoring technology.

¹⁶ Traditional systems monitoring alerts administrators when IT components become unavailable. Hitherto, a specialist interprets one or many alert(s). Operations tasks that follow include root-cause analysis, identifying failed components, evaluating situation and impact, and implementing solutions or workarounds to address the issue(s).

¹⁷ Correlation implies that monitoring and alerting tools, which are commonplace today, collected event data. For that reason, the two components are not specifically mentioned in the proposition.

¹⁸ Graphical representation of the proposition:

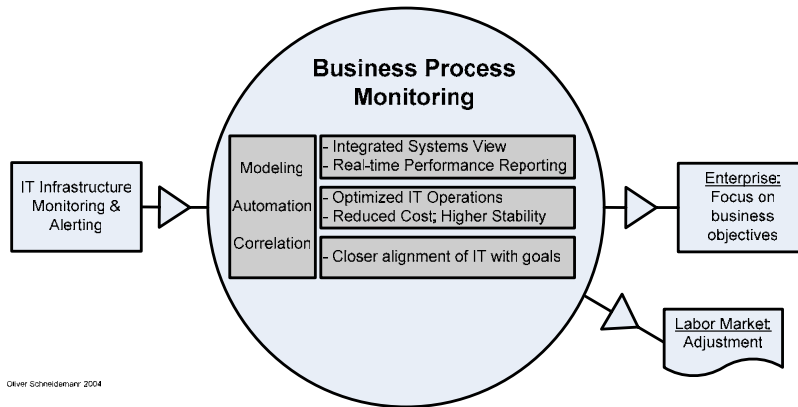


Figure 6: Study Proposition

¹⁹ Association for Computing Machinery <http://acm.org>.

²⁰ Brock et al (2003) referenced Kaplan and Norton's "Balanced Scorecard," see glossary term 'BSC'.

²¹ For example, they correlated use of IT resources (human & technical) to competitive advantage within industry types.

²² Hirschheim et al (2003) believed that the invention of "easy to use" (p. 24) personal computers and emerging Internet technologies caused business executives to expect that IT is straightforward to use and sustainable at low cost. Yet, they found also that other, previously existing circumstances in the firm they studied for their analysis contributed to the perception gap.

²³ Benamati and Lederer (1998) studied coping mechanisms exhibited by IT professionals and managers through analysis of responses to complexity caused by rapid change in IT products.

²⁴ Seddon et al (2002) correlated their data (sample size: 54) with an earlier study (sample sizes: 48). They found that fewer firms performed pre-project evaluations (-28%) or post-implementation reviews (-30%).

²⁵ 100 firms were randomly chosen (see http://www.usatoday.com/money/companies/2004-03-22-fortune-500-list_x.htm). Fortune 500 firms were selected assuming that large domestic and multinational organizations have adequate interest in optimizing their IT operations and are familiar with the topic. CIO names were obtained online, mostly from Hoovers (<http://premium.hoovers.com>) and Dun & Bradstreet (<http://mddi.dnb.com/mddi>). Some firms were excluded from the selection pool, for the following reasons:

- Supplier of IT products and services; possible conflict of interest
- Recent media reports discussed pending legal issues; responses therefore unlikely
- Recent CIO departure (Source: media reports, e.g. *InformationWeek*)
- Could not identify CIO/CTO unambiguously through online sources with reasonable effort

A free web service (<http://www.createsurvey.com>) was used to obtain most of the survey responses.

²⁶ Constitutes a limitation of this study. MetaGroup suggested that "market maturity" of event management tools would be achieved in 2007/2008. They recommended that customers assess the technology, while planning initiatives to make it work (Ferengul & O'Donnell, 2003).

²⁷ Interview questions were derived from the questionnaire used for the electronic survey.

²⁸ Not shown in the illustration.

²⁹ Not shown in an illustration.

³⁰ 17% = One responder

³¹ Of eBizQ.net, a portal for "business and IT professionals," who are "focused on business integration." See <http://www.ebizq.net/company/bios.html#beth>.

³² For example, compliance legislation such as the Sarbanes-Oxley Act (governs financial reporting of businesses, see <http://www.cfodirect.com>, "The Sarbanes-Oxley Act of 2002"), and HIPAA (Health Insurance Portability and Accountability Act. Outlines privacy rules in healthcare, see <http://aspe.hhs.gov/admsimp/pl104191.htm>)

³³ Response obtained through the survey form. Responder chose to remain unnamed.

³⁴ Underlying tendencies seem to have a wider range since pervasive "real-time" monitoring of life's basic aspects seems to hold much potential, too. McCoy pointed to the home security industry: service providers monitor private residences electronically and respond to intrusion and other issues. This type of technology could lead to other services and products, employing surveillance and alerting concepts. Increasing automation in more industries may therefore not only lead IT professionals to question how secure their jobs are.

³⁵ Instead of releasing new systems into production only after sufficient quality assurance testing. Insufficient testing is frequently caused by pressure to bring an application to market. Hypothetically, with BPM designers could release products prematurely without sufficient testing. Their fallacious conclusion could be that they allow the product to reach maturity in production since BPM alerts them to problems (which they then fix). This part of the discussion was rather speculative. There is no evidence that the approach is popular or widely contemplated. Due to the of IT's progressiveness and because of the potential created by automation, this issue could become a reality.

³⁶ 67% indicated that BPM-enabled cost savings would be added to profits. This is not surprising because profits and growth often seem more important than the interest of all constituencies. However, Oren Harari (1992) wrote, "Profits result from good management. They do not define good management." He reported that "pride in [the] work and the respect of [the] customers and peers", "fiercely loyal employees", "[being] passionate about service", and "technology, workforce development and customer interface systems [investments]" were cited by some business leaders as significant factors of their success. Harari concluded: "Those managers who live by the rule that their top priority is to make profits and enhance shareholder value will achieve precisely the opposite results."

³⁷ For example, CNN's Lou Dobbs maintains a "List of companies exporting jobs" online: <http://www.cnn.com/CNN/Programs/lou.dobbs.tonight>.

³⁸ Inherent dynamics in quality management already affect constituencies. Hirschhorn (1984) cited lack of detailed knowledge about the object to be evaluated, as well as ownership and collaboration conflicts between object user (or its designer) and the evaluator. Thus, tertiary variables ultimately may determine quality management trends.

³⁹ 67% indicate complexity is "Very" to "Extremely" significant.

⁴⁰ 67% indicate they believe BPM increases revenues. 67% of them also suggest that BPM-enabled cost savings should be added to profits.

⁴¹ CIO's responded to the question "What are the key success factors and likely barriers in this pursuit to align IT and core business?" citing communication, "credibility ... through results," "cost reduction," "agility," and business-driven IT requirements as important factors.

⁴² Believes that BPM is too new but will increase transparency.

⁴³ Believes that IT's strategic value has been "exaggerated."

⁴⁴ Believes that the question is vague and that shareholders influence how funds are used.

⁴⁵ Mason et al. (1997) wrote of MIS (Management Information Systems, a.k.a. IT) as a "discipline" in firms, and the resulting influences on organizations, industries, and society. They believed that "[IT professionals] have an ethical obligation to understand what has been changed in our society as a result of our activities" and that "MIS professionals must begin ... to record and examine [MIS/IT] history."

⁴⁶ Edwards (2004) wrote that employment vulnerable to automation includes IT jobs. He cited Bardhan, who asserted that 11% of the U.S. workforce is "at risk to outsourcing" and that jobs vulnerable to automation are "at risk" regardless of their location. Gartner estimated that up to 70% of IT infrastructure services could be performed remotely, without moving the data center (Karamouzis, Young, Iyengar, Terdiman, Marriott, and Brown, 2004).

⁴⁷ The U.S. Bureau of Labor Statistics (2003, November) listed more than one million domestic IT jobs in support, administrative, and maintenance related areas.

⁴⁸ More specifically, he contended that human desires result in the creation of jobs, that many human desires have yet to be discovered, and that possibilities for the creation of new industries and jobs have not yet been exhausted.

⁴⁹ U.S. Department of Labor, Bureau of Labor Statistics, <http://www.bls.gov>.

⁵⁰ Referring to sustainability through productivity and human/physical capital growth.

⁵¹ Farrell (2004) found that language and cultural barriers make "offshoring projects" more expensive in Germany. In addition, its strict labor laws prolong workforce adjustments.

⁵² I.e. activities such as physical equipment installation and other onsite-services.

⁵³ BPM will also not eliminate the need to prevent re-occurrence of IT problem incidents. As a result, process refinements and system improvements, as for example ITIL describes, addressing recurring issues will require –most likely only few– local senior technology specialists.

⁵⁴ For example, in teaching or social services professions.

⁵⁵ See IBM's autonomic computing proposition at <http://www.research.ibm.com/autonomic>.

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