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Emerging Knowledge Management Systems for Global Managers

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Abstract

Globalization has significantly changed the business practices employed by global companies over the last five years. The integration of emerging technologies into business processes has created a demand for new knowledge management systems. This paradigm shift has had a profound impact on some leading industries (e.g., automotive). The evolution of information systems and the reengineering of business processes have created a demand for managers with "data savvy" skill sets. The automotive industry was examined in the light of some significant changes that are occurring in the global market place. This article examines the drivers fueling the convergence of time, distance, data, voice, and video into web-centric information systems. This research will also explain some of the current knowledge management systems utilized by major organizations to create, capture, refine, store manage, and distribute knowledge across various units, divisions, and departments in a relatively seamless manner. Finally, the article will explain emerging (hybrid) knowledge management systems that are being used to meet the needs of mobile managers with real time data, information, knowledge, and wisdom and thereby providing better decisions.

Keywords: Emerging Knowledge management systems (EKMS), emerging technologies, e-commerce, m-business, wireless, protocols, client/server, IEEE, automotive industries, data warehouse (DW), supply chain management (SCM), enterprise resources management (ERP), management information systems (MIS), executive information systems (EIS), decision support systems, knowledge base (KB), business analytics (BA), artificial intelligence (AI), Intranet, Internet 2, Extranet, extensible markup language (XML)

Introduction

Today's global managers are facing unprecedented challeges outside their organizations fueled by environmental "forces of change" such as: globalization, emerging technologies, emerging best business practices, government regulations, competitive global financial markets, limited knowledge workers, and higher worker turnover rates. Most scholars and subject experts agree that environmental (external) forces may have triggered a "creative destructive cycle," thereby making most information systems obsolete and forcing many firms to reinvent their business processes (McKnight and Vaaler, 2001).

Historically, new business computer software applications have evolved every decade. For example, transaction processing systems were introduced in 1950s, management information systems in the 1960s, decision support systems in the 1970s, knowledge management and executive information systems in the 1980s, and electronic business and commerce systems in the 1990s (O'Brien, 2004). It is clear that management and technological paradigm shifts are occurring in today's global economy. Also, "global economic shifts" have created new information systems such as mobile business and commerce, virtual enterprise, and web-based database. In addition, new management change tools have been introduced such as: business process reengineering; process innovation; lean manufacturing; value stream mapping; six sigma-total quality management; the delta model and the balanced scorecard (Hax and Wilde II, 1999; Dicken, 2003; Kaplan and Norton, 2004).

This research examines the current knowledge management systems (KMS), popular change management tools (CMT), the role of information technology (IT) in the change process, the role of managers in the global economy, process-based knowledge mapping, and emerging knowledge management systems (EKMS). It also explores major "global business drivers" and their relationship with emerging knowledge management systems utilized by organizations and managers to compete in the new global economy. In addition, it proposes a "hybrid knowledge management model" for global managers to: collect and validate data; create value-added information; encourage the seamless transfer of knowledge within the organization; streamline the decision making process, promote organizational learning and memory, and store the knowledge in a central repository (e.g., web-based data warehouse) for any-time and any-where access (Turban, et al, 2005).

Current Popular Knowledge Management Systems

Most organizations use standard operating procedures to manage their business functions and processes. This systematic approach affords managers the opportunity to control and monitor the business functions and processes within the organization. There are many schools of thought about the preferred methodology used to collect data, generate information, and create knowledge within the organization. It is clear that gathering and storing tacit knowledge (accumulation of skill sets) builds intellectual capital to produce value-added goods and services (Geisler, 1999). This research has coined such a knowledge management tool as an "organizational book of knowledge" and regarded it as the "heart" of each organization.

Many knowledge management systems (KMS) were developed using the basic technological components such as communication, collaboration, reposition, and query (Turban, et al, 2005). These sets of technologies can be integrated into web-based information systems (e.g., management support systems) thereby affording managers the opportunity to conduct business via mobile devices (e.g., wireless personal digital assistance).

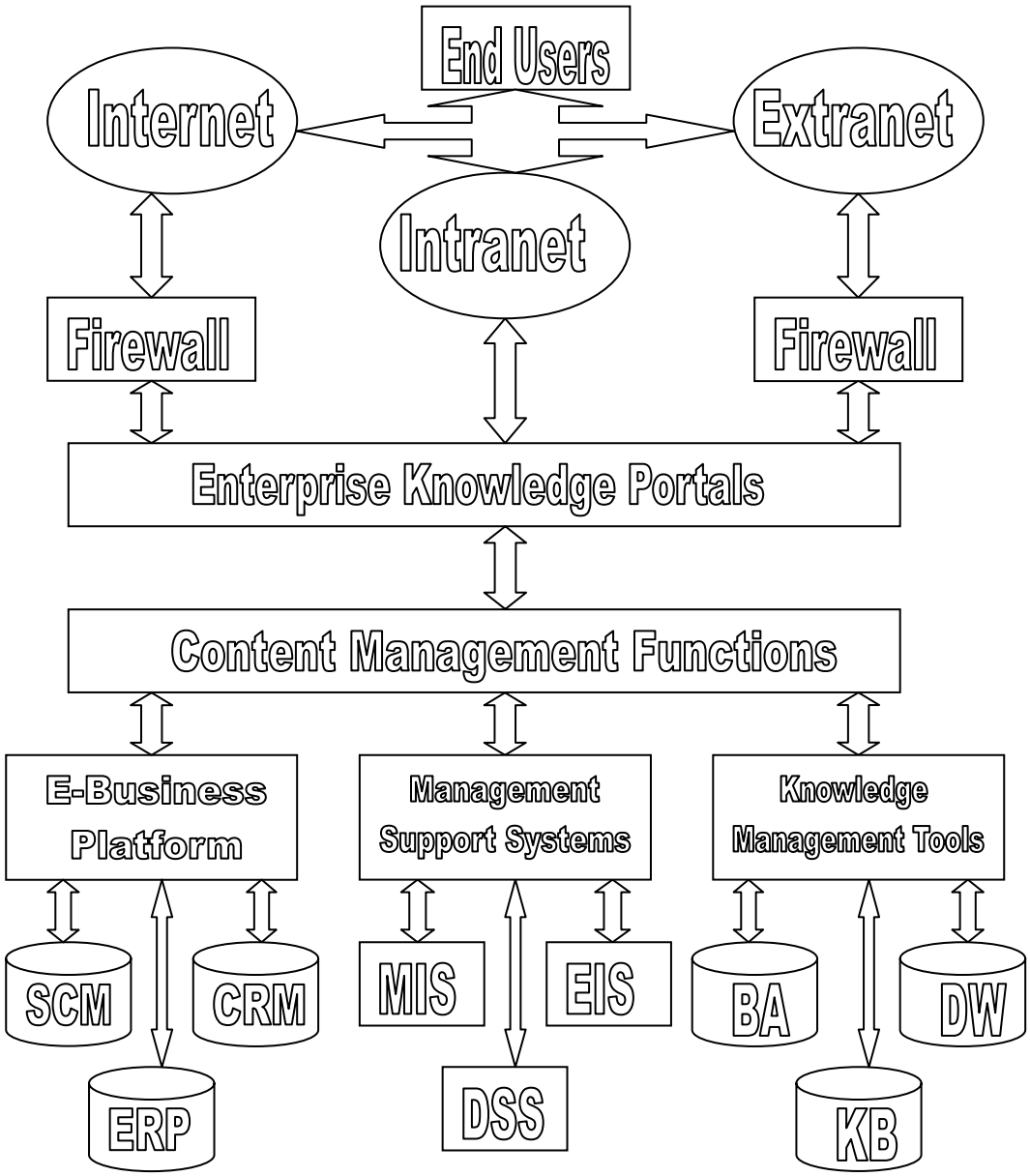
Most current popular knowledge management systems (KMS) are designed for end users such as: knowledge workers, managers, executives, suppliers, business partners, and customers. These end users can access the KMS via the Internet, Intranet, and Extranet connected to an enterprise knowledge portal that is used to provide single point of access to the organization's data, provide customized reports, enable collaboration on group projects, categorize searches, and monitor, and record an end user's profile based on the on-line activities (O'Brien, 2004).

Most end users can access structured (e.g., supply chain management) data and unstructured (e.g., e-mail) data and enterprise knowledge from several reliable sources. Operations managers need timely and accurate data to make decisions during their daily work activities. In contrast, middle and upper level managers need cross-functional information to develop business, sales, marketing, staffing, distribution, and manufacturing strategic plans. Automated content management tools (e.g., IBM DB2) have been developed to organize and control the "knowledge management cycle" (i.e., create, capture, refine, store, supervise, distribute), due to the high degree of volume and speed of data and the information and knowledge generated by business and manufacturing processes. Most organizations use popular knowledge management tools such as: business analytics (BA), knowledge base (KM), and data warehouse (DW) to provide information to the end users. Also, Fortune 500 companies use e-business databases such as supply chain

management (SCM), enterprise resources planning (ERP), and customer relationship management (CRM). Medium and large organizations use management support systems such as management information systems (MIS), decision support systems (DSS), and executive information systems (EIS) to develop their strategic business plans. Knowledge management portals such as best practices, groupware tools, databases, and enterprise resources functions are components of the emerging knowledge management systems (Laudon and Laudon, 2005).

Figure 1 shows the basic holistic knowledge management systems with connectivity (hooks) to other information system and databases.

Figure 1 –Web-based Internetworked Knowledge Management System



(O'Brien, 2004; Cuffe, 2005)

Globalization has created a demand for collaborative knowledge work systems (e.g., CAD/CAM, electronic brainstorming, groupware, virtual reality systems, distance learning) thereby allowing global workers the opportunity to share the various components of their projects any where and any place. Also, mergers and acquisitions in competitive industries (e.g., automotive) have melded information systems (e.g., middleware) into a cohesive network of information sharing enterprises. Listed below are the knowledge management strategies and tools that have been implemented by some major global organizations:

- **DaimlerChrysler AG**: Deployed the "Engineering Book of Knowledge" to capture and distribute the knowledge generated by the subject matter experts. Developed a World-Wide Intranet system (Wel-Kom) to transfer knowledge from one unit to another. Deployed a "Post Merger Integration Program" to transfer knowledge and share information across the firm's locations (e.g., US, and Germany). Their engineers used CAD simulation and modeling tools to reduce the number of car prototypes by 50%.

- **Ford Motor Company**: Deployed an Internet-based strategy that allowed dealers and suppliers to share information stored in its knowledge base (770 websites, 500,000 documents). Implemented a 40-step process for monitoring and deploying best practices. Supporting staff members (focal points) were deployed to document current best practices and make recommendations for improvements.

- **General Motor Corporation**: Created a GM University to reinvent the organization via learning strategies. Shared engineering, manufacturing, and design information (best practices) through an Intranet. Supporting staff members would coach managers to record their decisions as lessons learned to enhance the organizational learning and memory process. Subject matter experts would observe the vehicle development teams and include distributed their suggestions to others via the knowledge systems.

- **Toyota**: They did not have a formal knowledge management strategy. However, they created a Toyota University to enable organizational learning and memory retention. Managers coached workers to submit and evaluate their process improvement suggestions which were stored in a central repository (database).

- **General Electric**: Used e-commerce tools to "globalize" the intellectual properties within the company. Deployed cross-business and functional teams (councils) to share best practices in key business units (e.g., marketing, sales, technology, manufacturing). Implemented a "best practice matrix" to empower cross-functional teams to compare and contrast creative practices used within GE. Used "Six Sigma" metrics to monitor and record productivity gains (machinery Vs innovation).

- **Hughes Space and Communications**: Deployed an internal knowledge management system to minimize task duplication and process redundancies.

- **Siemens**: Corporate staff members were committed to the knowledge management strategy and implemented a common methodology to work together on different projects.

- **The World Bank**: Provided funding for Knowledge Management projects and nurtured organizational structures thereby formalizing community activities. Encouraged the participation of outside experts to work with the bank's subject matter experts on projects. Empowered internal experts to provide the bank's customers with validated information in a timely manner.

(Rukstad and Coughlan, 2001)

New Economy Organizational Structures

Most global organizations are in a *state of flux* or *punctuated equilibrium* due to the increased level of competitiveness occurring in the market place. For example, mergers, acquisitions, bankruptcies, reengineering, restructuring, and paradigm shifts have forced many companies to rethink or re-examine their organizational structures to meet the challenges of the new economy. There are many schools of thought about the *best fit* for managers in redesigned organization structures. Notably, organizations are *living entities* and must respond quickly to changes occurring in the new (global) economy. What is the best organizational structure (mechanistic or organic)? What kind of managers will be required?

Redesigning organizational structures can be very challenging for most management consultants and organizational development teams. However, finding the correct *fit* for employees in the new business units, divisions, and departments will require new insights into various organic organizational structures (e.g., matrix). For example, popular "fit tests" such as parenting advantage, people test, feasibility test, accountability test, flexibility test, and linkage test can be used to mitigate the risk of organizational "meltdown" (Goold & Campbell, 2002). It can be argued that overly complex organic and "loose" flat organizational structures will fail due to roles and responsibilities ambiguity, thereby resulting in negative consequences.

Many organizations are trying to cope with the changes of the new economy by introducing new senior managers in the redesigned business units and divisions. For example, major Fortune 100 companies have introduced Chief Knowledge Officer (CKO) and Chief Technology Officer (CTO) to work with other senior managers (e.g., CIO, VPs) on strategic business plans. Most firms have created a CKO position to direct knowledge management projects, thereby maximizing organizational learning and knowledge sharing (Turban, et al, 2005). Some scholars and consultants have argued that the role and responsibilities of the Chief Information Officer, Chief Technology Officer, and Chief Knowledge Officer may be "blurred" due to the competition of resources (manpower and funds) and special working relationships with the Chief Executive Officer (CEO), Chief Financial Officer (CFO), and Chief Operations Officer (COO) (DeTienne, et al, 2004). It is clear that the organizational book of knowledge (OBOK) must be available to senior managers so that they may collaborate on strategic business plans. Also, authorized employees (e.g., middle level managers, analysts, knowledge engineers, and subject matter experts), suppliers, and business partners must have 24/7 access to the OBOK via web-enabled telecommunications to enhance the knowledge transfer process.

The Role of Global Managers in the Change Process

Environmental forces of change (e.g., globalization, competition, technology, labor, regulation, finance) have changed the rules of the management game (Ball, 2004). Today's managers are facing unprecedented changes and paradigm shifts that have forced some to question their role (leader, coach or follower) in the new global economy. It is clear that operational, middle level and upper level managers have unique roles and responsibilities in the change process. For example, senior managers develop the vision and/or mission statement for the organization. The functional (middle level) managers develop business plans based on the vision or mission statement that are implemented by operations managers. It can be argued that middle mangers may not be flexible team players in executing the mission statements. However, some studies have shown that middle managers are best suited to implement radical change (e.g., business process reengineering) throughout the organization. In contrast, some senior managers consider middle managers as "resistors of change" since they are viewed as "fence sitters" or "compliant children" during the organizational development and/or turnaround process (Huy, 2001).

What is the "best fit" for managers during the organizational development process? How does the organization select mangers for various positions during a turnaround process? Some scholars argue that job placement is driven from the top down since the middle and lower managers may be reluctant to volunteer for key positions created by the change agent. Interestingly, some global firms may reassign their top executives (i.e., global leaders) to various key positions during a strategic change program (Green, et al, 2003). For example, DaimlerChrysler AG supervisory board transferred Dr. Dieter Zetsche from the home office (Stuttgart, Germany) to the Chrysler Group corporate office (Auburn Hills, Michigan) as the new change agent to direct the unit's turnaround plan. Interestingly, Dr. Zetsche (President and CEO) and his senior executives implemented a successful turnaround plan that produced significant improvements in sales, quality, and profit in 2004. The turnaround plan was driven by timely and accurate information generated by Chrysler's Information Technology Department that was supported by many information systems. It can be argued that Sue Unger, Senior Vice President and Chief Information Officer of Daimler Chrysler AG implemented several mission critical information systems that provided Dr. Zetsche and his team with timely, reliable data and information to execute the change strategy. Sue Unger's Information Technology strategy may have been part of Jurgen Schrempp's (DaimlerChrysler AG's CEO) *Knowledge Management Strategy* that was presented to senior executives on the Mediterranean island of Malta during their April 2000 meeting (Rukstad, & Coughlan, 2003). Successful global firms must maintain their competitive edge by acquiring real time information across many time zones via sophisticated information systems and develop strategic business objectives to meet the challenges in the market place.

It is clear that managers must make expedient decisions based on data and information stored on knowledge management systems. Unfortunately, some traditional (old economy) managers may be comfortable making decisions based on tacit knowledge. Regrettably, their legacy skill sets may not be helpful when faced with emerging issues and/or challenges in the workplace and/or marketplace. In contrast, global leaders are comfortable making decisions based on data and information stored in knowledge management, decision support, and management information systems.

Some scholars and consultants agree that today's managers must perform similar to a pilot trying to land his/her plane in a snow or rain storm thereby trusting the aircraft's instruments and not primarily watching the outside elements. Fortunately, several management tools (e.g., balanced scorecard, six sigma metrics) are available to today's managers so that they may make better decisions when faced with uncertainty or chaotic situations in the workplace and/or market place (Kaplan and Norton, 2000). For example, The Chrysler Group (US unit) used the *Balanced Scorecard* tool to monitor its business functions and operations thereby resulting in significant profit and productivity gains in 2004. Metalcraft, a tier one (1) automotive supplier (i.e., shipped finished parts directly to automakers) developed an information based (i.e., EDI) scorecard (green, yellow, red) to monitor the quality of their incoming parts from their suppliers (Kulp, Narayanan, and Verkleeren, 2002). Chrysler Group initiated an online (Intranet and Extranet) Supplier Cost-Reduction (SCORE) program in the 1990s to support their turnaround plan. GroupWare technologies such as Lotus Notes and Dominoes were integrated into the SCORE program that resulted in $2 billion of savings during the year 2000 (Turban, et al, 2005).

The competitive nature of the automotive industry has witnessed a significant change in the ranking of major automakers. For example, Toyota has replaced DaimlerChrysler AG last year as the third largest North American car maker. Interestingly, Toyota had previously replaced Ford Motor Company as the world largest second automaker. Most scholars and consultants agree that Toyota's competitive weapon was its famous "Toyota Production System." In contrast, other scholars have argued that Toyota's unpublished *Book of Knowledge* may be the "heart" of its significant upward movement in world *automaking* ranking. Currently, General Motor Corporation is facing severe *hurdles* in the marketplace such as: a loss of $1.1 billion on expenditure of $3.5 billion during its first quarter 2005, a recall of 2 million vehicles, a lower (25.6%) US market share as of first quarter 2005, higher legacy costs per vehicle, a Standards & Poors (S&P) lowered debt rating to junk status for the first time in its history (Welch and Beucker, 2005). It can be argued that GM's current hurdles and lack of any published action plan may give Toyota an opportunity to make further gains in the global marketplace, thereby becoming the world's number one automaker and displacing GM (a position held since 1931).

The Role of Emerging Technologies in the Change Process

The rapid increase in the deployment of emerging technologies (e.g. Internet, Intranet, Extranet, e-commerce, e-business, m-business, m-commerce, Voice over Internet Protocol [VoIP]), wireless, intelligent software agents, extensible markup language [XML] tools, radio frequency identification [RFID] tags, and web-based databases) into business processes of global organizations have forced many managers and executives to reinvent their decision-making methodologies. Automotive ID technologies such as RFID will enable the automakers to track their materials and products via web-based real time knowledge management systems through the supply, production, inventory, distribution, and revenue chains (Stackpole, 2005). Global executives are more mobile in the new economy and depend upon telecommunications to conduct business away from the office. Today's executives are more challenged than previous due to the emerging mobile economy (Kalakota and Robinson, 2002). Also, the convergences of Internet, e-business, and wireless have created new opportunities for mobile economy (m-economy) companies in developing emerging management enterprise systems to meet the needs of mobile executives. Scholars and consultants agree that the Year 2000

(Y2K) remediation programs prepared many organizations for the introduction of e-commerce and m-commerce applications. Enabling technologies can foster greater organizational changes due to the rapid decline in price and physical size of the devices. The convergence of time and space via high speed telecommunications has created a need for advanced KMSs (Dickson and DeSanctis, 2002).

Today's global executives are more mobile, and they reach out to telecommunications and information technology sector for innovative solutions to allow them to conduct business while *on the move*. However, there are many *front-end* mobile devices (e.g., personal digital assists, cellular phones, notebooks, hybrid x-boxes) that can connect to *back-office* information systems (e.g. web-based database) via wireless technologies (e.g., VoIP, and broadband) and standards (e.g., Bluetooth, WAP 2.0 and IEEE 802.11). Low cost telephone service via VoIP technologies will fuel the growth of the m-commerce and m-business market. Also, new security applications (e.g., encryption) will emerge to protect the data transactions and voice communications over wireless networks (Dornan, 2002).

It can be argued that the convergence of telecommunications, Internet, World Wide Web, and computer-mediated networks have created new opportunities for information management companies (Housel and Skopec, 2001; Panko, 1999). This new demand is fueled by the global managers who have aggressive (frequent) travel schedules and are forced to make decisions away from their home offices. It is clear that the current management support systems must evolve to meet the needs of these busy managers and executives. Also, the borderless new global (24/7) economy has forced many organizations to respond to customers' demands before competitors do. Most major automakers (i.e., General Motors Corporation, Ford Motor Company, DaimlerChrysler AG, Toyota, Nissan, VW, and BMW) are integrating disruptive technologies (e.g., semantic web and service-orientated software architecture) into their business processes and manufacturing facilities to respond to customers' demands for competitive products and faster delivery dates (Alper, 2005; Moade, 2005). For example, Ford Motor Company used emerging information technologies (e.g., Internet tools) and lessons learned from high-tech industries to reengineer their *supply chain strategy* (Austin, 2001).

Managers should be careful when integrating disruptive technologies into their organizations. The automotive industry's failed portal (*Covisint)* could be attributed to: immature (un-proven) extensible markup language (XML), web-based applications, and suppliers' resistance to emerging technologies. In contrast, automotive companies have implemented Radio Frequency Identification (RFID) technology in their manufacturing facilities and supply chain. Wal-Mart mandated their suppliers to install RFID tags (active and/or passive) in shipments for *ease-of-tracking* and supply chain management enhancements.

Most organizations are implementing new *e-strategies* to remain competitive in the new economy. Managers are participating in new information technology projects to take advantage of Internet capabilities. For example, e-commerce types such as: business-to-business (B2B), business-to-consumer (B2C), customer-to-business (C2B), government-to-business (G2B), and e-commerce strategies can be implemented in conjunction with enhanced knowledge management systems (KMS). This approach has streamlined the management decision process thereby improving organizational effectiveness. Customers can place their orders directly with companies via e-commerce technologies and the related information is automatically processed by the KMS. In contrast, m-commerce applications and services did not expand at a rapid rate in the US, Japan, and Europe due to miniaturization of

keyboards, and screens and lack of easy use of *thin clients* (Laudon and Laudon, 2005).

The record number of corporate bankruptcies (e.g., Enron, WorldCom, and Global Crossing) has led to new government regulations and laws. Knowledge management firms and developers are challenged to deliver emerging KMS to assist managers and executives in remaining compliant with government regulations and filings (Gincel, 2004). Company directors are now required to attend a minimum number of board meetings each year and fully participate in the activities to ensure that corporate governance is maintained. Government regulations and tools such as government-to-business (G2B) and business-to-government (B2G) are forcing many organizations to upgrade their current KMS. Government agencies are now installing sophisticated computer-based systems to monitor the electronic filings of companies (Nyberg, 2004).

What are some of the *external drivers* forcing most managers to develop emerging KMSs? Why should managers be concerned about environmental forces? It is clear that managers are facing challenges to implement section 404 and 409 of Sarbanes-Oxly (SOX) and Securities and Exchange Commission (SEC) rules that added eight *triggers* for 8-K filings. Chief Financial Officers (CFOs) and Chief Operating Officers (CEOs) are required to certify their financial reports as part of section 404 of Sarbanes-Oxly (Katz, 2004). New e-business models assist managers with SEC filings, thereby reducing the risks of non-compliance.

The Sarbanes-Oxly (SOX) laws were passed by the US Congress to provide more corporate oversight because of the record number of bankruptcies (e.g., Enron, Global Crossing and WorldCom) and reduce the number of corporate restated earnings. Notably, some Fortune 500 companies file reports electronically to receive faster compliance feedback from the SEC. Section 409 of the SOX requires firms with capitalization (valuation) over $75 million dollar to use best business practices and due diligence to minimize the risks of errors in reporting data. Changes in the firm's assets must be reported with 48 hours (Gincel, 2004).

This research believes that a hybrid KMS will minimize or mitigate the risk of failures and non-compliance with the new Sarbanes-Oxly laws. Also, managers should integrate parts of the existing KMS in conjunction with proven management tools to create a customized e-business model that fits the organization's business plan. Customization is the "wave of the future" in the chaotic new economy since previous e-business models have not met managers' expectations. This article will examine tenets of the emerging knowledge management systems (EKMS) and its connectivity to other information systems via new telecommunications tools. It will also examine the ramifications of the emerging markets' (e.g., China, India, Brazil) demand for *globalized* knowledge management systems to meet its requirements for the seamless transfer of information in an m-economy. It is clear that more semi-mature subsystems (e.g., expert systems, management information systems, decision support systems, and artificial intelligence) must be integrated into the EKMS, thereby providing managers with timely and accurate information. Enterprise intelligent systems consisting of emerging technologies (i.e., e-business tools, web-based databases, virtual enterprises, data warehouse) can be considered as alternative EKMS (Turban and Aronson, 2004).

Emerging Knowledge Management Systems

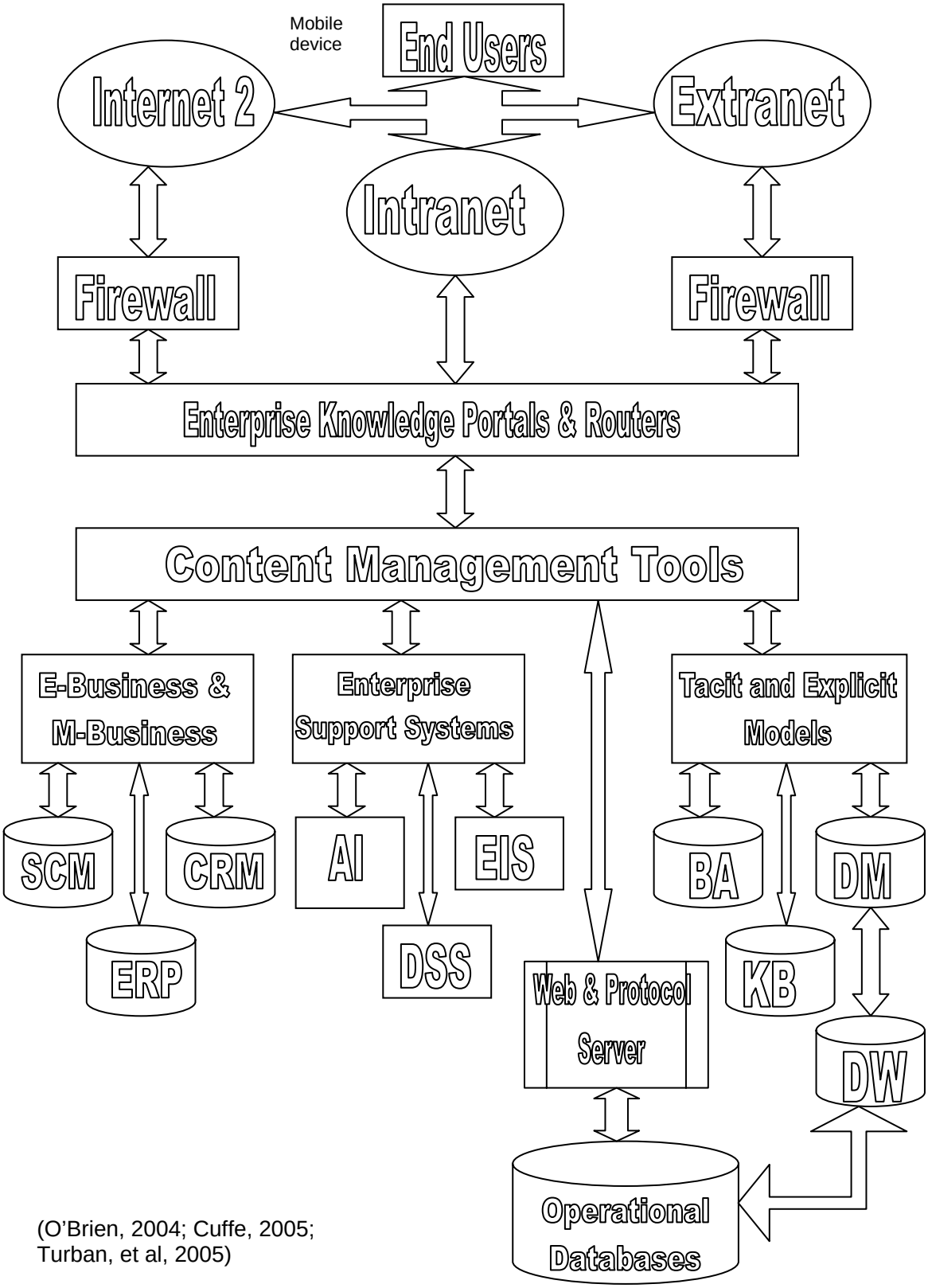
Most scholars agree that the current KMSs may have outlived their usefulness due to the rapid rate of change of technological and economic forces occurring in the global economy. Emerging technologies and global business drivers have fueled the demand for web-enabled knowledge management systems to assist global managers in making better and faster decisions. Perhaps a *creative destructive stimulant* (e.g., outsourcing) was needed to fuel quantum changes within most organizations to compete in the global economy. Outsourcing strategies need supporting information systems to coordinate business processes in various global operation centers (e.g., engineering, product development and manufacturing). For example, some Fortune 500 companies have outsourced engineering services and production to India and China over the last five years to maintain their competitive position in the global economy. China and India will be major players in the "global economic growth game" over the next five years and have attracted multi-billion dollar worth of foreign direct investments from many industrial nations. Major global automakers (i.e., GM, Toyota, Ford, DaimlerChrysler [DCX], and VW) have entered into joint ventures and alliances with Chinese partners to produce automobiles for the local and regional markets (Welch and Beucke, 2005).

It is clear that previous knowledge management systems have not met the needs of some automakers due to their dismal performance of sales, product design, quality, and profitability. Why have some of these KMS failed to meet users' expectations? What were the tools used to map the current business process for developing the knowledge management model? Using *the basic systems model*, it can be argued that poor coordination and processing of various knowledge sources (inputs) and the actual business outcomes (e.g., profits, and favorable S & P ratings) could produce significant differences of gaps thereby leading to failed expectations and lost opportunities. For example, inputs such as data, information technology, best practices, core competencies, skill sets, can be processed via computer mediated systems, thereby producing value-added knowledge to enhance the decision making and organizational learning processes (Malthora, 2004). Other reasons for failure of KMS's may be: poor connectivity to other information systems, lack of updates, not web-enabled (XML) for 24/7 access, lack of validated data and information during the acquisition phase, poor content management, inadequate document management control polices, minimal integration of end users suggestions for improvements, lack of employees' ownership. Some studies have suggested that, if missed KMS objectives are factored into failure rates computations, the results could be between 50-75% (Turban, et al, 2005).

Most scholars and consultants agree that new KMS must be web-centric and integrated into the organization's major information systems (e.g., decision support systems), thereby allowing the global managers 24/7 access. What type of emerging architecture (e.g., web-centric protocols and computer languages) is required to support customized knowledge management systems? What type of connectivity and portability (i.e., accounting and financial systems) is required to ensure compliance with the various regulatory agency filings? Global managers must have access to various information systems via mobile devices (e.g., personal digital assistance, wireless PC, and cell phone) since they are spending more time away from the office. New tools are required to assist managers make better decisions, thereby staying engaged in the day-to-day business operations (i.e., remain in the loop).

The knowledge management system architecture should include the following components: data-centric portals and gateways, data mining tools, middleware, data warehouse, online-analytical processing tools (OLAP), operational databases, web-centric protocols, management support systems, and web-based databases. Notably, open database connectivity standards such as Microsoft OLE DB and ADO are used by end users to access relational databases via web servers. The Simple Object Access Protocol (SOAP) in conjunction with extensible markup language (XML) can facilitate the *ease-of-transfer* of data across the Internet (Kroenke, 2004; Marwick, 2001). Managers must be able to search the various databases using OLAP and data mining tools to answer What? Why?, How?, When?, Where? and What-if? questions, during their day-to-day responsibilities. Unfortunately, if the context (i.e., data, information, knowledge and wisdom) provided by the data bases and warehouses are limited, then managers will be forced to make intuitive decisions that could result in un-intended consequences (Pohl, 2003). Decision support systems (DSS), management support systems (MIS), and executive support systems (EIS) are important components of emerging knowledge management systems. The EIS architecture should be web-centric and client/server based to access information and data from various systems such as a SQL server, a data warehouse, a Groupware Server, a Web Server, a mainframe, an e-mail server, and a file server (Marakas, 2003). This writer has postulated a holistic-hybrid knowledge management system in Figure 2 with integrative emerging technologies that can assist mangers make better decisions.

Figure 2 – Holistic-Hybrid Knowledge Management System



(O'Brien, 2004; Cuffe, 2005; Turban, et al, 2005)

Emerging knowledge management systems (EKMS) will include: encryption tools, existing client/server applications, new ultra high speed (fat pipes) Internet 2 (scheduled for deployment within 2-3 years), emerging technologies, and 5) mobile (wireless) devices (e.g., personal digital assistant, fat clients, cell phones, notebooks, lap top PCs, and x-boxes), government regulations and guidelines (SOX), financial information systems (FIS), accounting information systems (AIS), best business practices, ethical practices, and legal guidelines. The mobile economy (m-economy) fueled by the convergence of the Internet 2, e-business, web-centric servers, protocols, routers and wireless networks (e.g., Wi-Fi) will allow end users to access the EKMS anytime, anywhere and use any device. The m-economy is driven by new economy strategies and tools resulting in the creation of the m-business platform (i.e., Internet + E-Commerce + wireless + E-Business). There is a paradigm shift occurring, that will move end users away from fixed e-commerce and e-business applications to m-business solutions. This new phenomenon (a best business practice) will allow managers to conduct business while on the move (Kalakota and Robinson, 2002).

Information overload and lack of correct data, information, knowledge and wisdom are major concerns for most global organizations faced with limited resources to solve complex problems and make mission-critical business decisions. Managers need assistance from computers that can function close to human intelligence to provide solutions to complex situations with minimal, erroneous, and ambiguous information. Artificial (e.g., expert systems, visual perception and virtual reality) intelligence (AI) tools should be integrated into the KMSs to make better decisions, thereby reducing human errors and man-hours searching for the correct data and information (O'Brien, 2004). Companies needs tools to perform studies such as: competitive benchmarking (best-in-class or best-of-breed), strength, weakness, opportunities (SWOT) analysis, gap analysis, forecasting, data mining, and online analytic processing (OLAP). Business analytics (BA) tools can assist analysts in accessing emerging knowledge management systems for operation and financial reports. For example, Southwest Airlines used new business intelligence and analysis tools to assist their managers make better decisions that resulted in a significant improvement in the "bottom-line" for the year 2002 (Turban, et al, 2005).

Middle level managers need tactical models to assist them to plan short term events (e.g., less than 2 years). In contrast, low level managers need operational models to assist them during the day-to-day activities in making routine daily decisions such as approving loans and planning production. High level (strategic) managers need explicit models to assist them with long term planning and resolve un-planned events with minimal information. Senior managers make decisions that have broad impact on their organizations. It is imperative that these senior managers have the best information and knowledge about the issues before making decisions based on "legacy business practices." Most scholars and consultants agree that today's managers are faced with many challenges (e.g., privacy, legal, ethical, safety, vigilance, governance, regulatory) that will require sophisticated hybrid knowledge management systems (e.g., ES, DSS, EIS) to minimize or mitigate the risks of making poor decisions. It is clear that the hybrid KMSs must be designed to overcome a phenomenon termed the "Peter Principle" where as the managers may not have the correct skills and/or ability to interpret the data and information at hand. Regrettably, these "Peter Principle Managers" may elect to "do nothing" and wait for perfect information or corporate guidance, only to miss potential business opportunities (Marakas, 2003).

Conclusion

Global organizations are supported by knowledgeable workers with sophisticated skill sets to interpret the data and information stored in various information systems. However, the current changes in major industries (e.g., automotive) would suggest that today's knowledge management systems may not have provided managers with credible information to mitigate the risks of organizational failures in the marketplace. It is clear that, innovative solutions are required to fuel the evolution of knowledge management systems to meet the challenges ahead. Emerging technologies (e.g., RFID, m-business, and wireless networks) will generate large volume of data, information that may be disruptive to most organizations' information systems (e.g., KMS, ERP, and SCM). Unfortunately, some global firms may not have updated KMS to defend themselves against the competitors who will disrupt and dominate their market (Moad, 2005). Managers need real time information to make decisions when faced with uncertainty or chaotic situations in the market place. Proactive managers who "think outside the box" and manage their operations or business processes with credible data (e.g., financial, operations, production, and sales) will survive and prosper. Regrettably, legacy managers with poor "data management" skills will be replaced with cost effective knowledge workers (e.g., knowledge engineers, analysts, and subject matters experts) who will prepare competitive and operational reports for the middle and senior level managers in a reduced time frame.

In conclusion, knowledge acquisition, and sharing and distribution processes will be coordinated by sophisticated KMSs with web-centric connectivity to other business-critical information systems (e.g., FIS, AIS, DSS, and EIS). These hybrid KMS will allow the knowledge workers to collaborate remotely (24/7) on projects via high speed *fat pipes* (large bandwidth), Internet 2, and web-based tools and applications. Also, leading industries (e.g., automotive) will collaborate with universities and key public sectors to develop hybrid KMSs in a reduced and cost-effective manner. If organizations have real time data and information stored in web-centric information systems, then their managers can be proactive in the decision making process.

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