The Impact of Web 2.0 on Technology

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Summary
The current generation of web-based social networking applications and services is designed around an architecture of participation and communal collaboration. Web 2.0 authoring tools enable users to collaboratively create, share and recreate knowledge from multiple sources, leverage collective intelligence and organize action. These authoring tools and applications exploit and extend the building blocks of existing web-based business applications. This paper explores the Web 2.0 world encompassed by the wide range of Technology from a business perspective. The paper discusses our definition of business-related technology and then focuses on defining and exploring Web 2.0. Following this discussion we examine the new business-related technologies and opportunities that Web 2.0 offers above and beyond brick and mortar and extensions to the internet. We examine and discuss the approaches and extensions that are being deployed for technologies in the business environment.

Key Words
Technology, Web 2.0, social networking, information systems.

1. Introduction

The impact of technology on an organization's functions and change has been nothing short of profound. To sustain competitive advantage in the global market, firms need to address their management of technology. Technology must be managed, utilized and deployed to enhance the firm's competitive position. Businesses have harnessed technology through the use of knowledge derived from the technology and the corporate system. A full realization of the knowledge and expertise embedded in the firm's employees together with the firm's resident technologies forms the basis for the organization's value.

The relationship between people and technology has special meaning and characteristics. Technologies themselves have no emotional capacity, though we still tend to imbue them with personalities to make our relationship with them more fulfilling. Such technologies related to computers and software, on the other hand, can become pervasive. People within the organization can become so focused on the gadgets and devices that they lose perspective of the goals and objectives of the firm. Pasmore (1988) argued that at a fundamental level, "It is our propensity to develop relationships with inanimate technological artifacts that explains why the interdependence between social and technical systems in organizations requires careful attention". On the other hand, the worth of the individual and team synergy in conjunction with technology needs to be taken into account.

American manufacturing industries are experiencing competitive pressure from every corner on the planet (Nahm and Ishikawa, 2004). The advancement in computer networks and information technologies has reshaped these companies. A number of innovative manufacturing and management strategies have emerged. Although they have different definitions and scopes, there are several common issues: inter-enterprise functions integration; inter-enterprise resources integration; and especially collaboration enabled web-based applications.

Businesses have intensified the identification and engagement of its staff through participation in professional networks and multiple interest groups. This bundle of relatively new social networking tools is commonly refereed to as "Web 2.0". Eijkman (2008) drew on Boyd (2005), O'Reilly(2005), Freeman (2006), Hihchcliff (2006) and Anderson (2007) to describe Web 2.0 broadly as -- the current generation of web-based social networking applications and services designed around an architecture of participation and communal collaboration. Web 2.0 authoring tools enable users to collaboratively create, share and recreate knowledge from multiple sources, leverage collective intelligence and organize action. According to O'Reilly (2006) it is the business revolution in the computer industry caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. Chief among those rules is the construction of applications that harness network effects to get better the more people use them.

Manuscript received February 5, 2009
Manuscript revised February 20, 2009

Web 2.0 authoring tools and applications, such as Wikis, blogs and multimedia sharing services, exploit and extend the building blocks of existing web-based technologies. This provides businesses with a different kind of learning space. Social networking and collaborative knowledge construction is enabled through in-depth access to a range of networked communities of practice (Freeman, 2006).

Technology is an encompassing term dealing with the knowledge of humanity's tools and crafts. Technology is also a cultural activity that predates both science and engineering. It is a far-reaching term that includes both simple tools, such as a wooden spoon, and complex tools, such as the space station. Its scope includes any tool in any discipline. This is not to imply that technology is the only cultural forming activity, nor that it is the primary culture-forming activity. Often, it is dominate in cultural formation; often, it is not. In addition, culture may act to form technology. Due to widespread, and sometime careless, use of technology, several other topics arise in the study of technology, including technological ethics, environmental impacts, technological by-products, technological risk, among many other philosophical and sociological topics.

2. Technology and the Organization

Technologies at the most basic level are the tools, techniques, methods, devices, configurations, knowledge, procedures, actions, and support mechanisms used by organizational members to acquire inputs from suppliers, to transform these inputs into outputs, and to provide outputs as products or services to customers, both internal and external (Perrow, 1967) (Rosseau, 1979) (Kast and Rosenweig, 1985) (Pasmore, 1988) Organizational technology, as shown in Figure 1, can include choices about: raw materials, semi-finished goods and even people; how the technology is defined and presented; work design or redesign; control processes; research and development; and in some sense, how to approach and utilize computer-based technologies to support the infrastructure framed by the other technologies, parlaying them into a competitive weapon. In many cases these choices focus on whether to make or buy the materials and elements that define their product or service.

The management of technology can transcend the concerns of production processes, machinery, and work procedures. The decisions made about the choices available and the processes used to arrive at those decisions differentiate the organization. In addition, any one of the technology–related choices could potentially influence choices made for many of the aspects of the organization. For example, a decision to change the factory floor to a paperless environment by replacing manual and semi-automated support systems with dynamic, electronic visual status and target displays as part of the facilities movement to a Manufacturing Enterprise System [MES] implies a shift from efficiency to reliability and moreover worker involvement and empowerment.

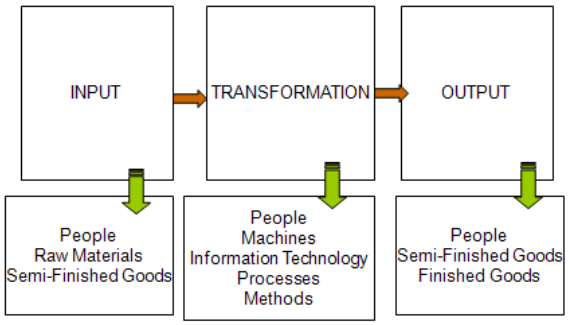

Figure 1: Technology

To compete in today's complex business world, organizations need well-designed and executed operations. Economic growth requires productivity growth. Keep in mind that this just doesn't happen by just getting people to work faster and harder. These are the business driven technologies depicted in Figure 2. It comes from being smart – the way we design a product or formulate service. We can lower costs with more efficient processes and ultimately raise profits. Being efficient is a start but what is really needed is an understanding as to what the "customer wants and needs." (Rapaille, 2007) Technology change, capital investment, improved labor quality and other factors are the drivers of productivity accompanied by the understanding that we want to deliver the right product to the right customer at the right time. This target can vary and depends on the right place as well.

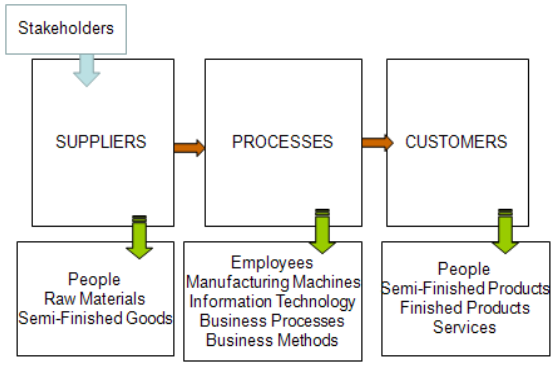

Figure 2. Business Driven Technology

Technologies dealing with computer hardware, communication hardware, user interface devices, storage, software, artificial intelligence, robotics, and computer

aided manufacturing, as shown in Figure 3, have, in the recent past been broadly categorized as information technology (IT). Of late there is a tendency to separate this spectrum into such categories as communication technologies, information technology, computer-supported technologies, and for better want of a word business-supporting technologies. The most important category though is the heart of the information processing system – the information processing engine. The nature of the benefits originating from these technologies depends on the technologies themselves. A number of the business-related technologies are typically part of the production process of either the product or the service provided by the firm. All businesses use some sort of technology to support their operation – be it just a small network of personal computers using an off-the-shelf accounting software or an elaborate network of computers providing a total business solution. In the providing of goods or services the technology itself can become one of the products. IT is used to exploit and aid the production process through the use of software — things that we take for granted such as e–mail, voice-mail, social computing, group decision making and communication using a web-like interface deployed on the company's intranet (an internal version of the internet).. Computers can also be an essential part of a new product or service — for example, a car's onboard instrumentation.

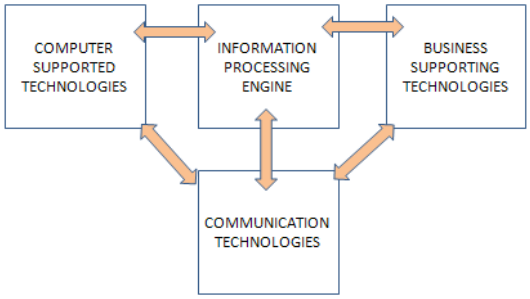

Figure 3. Business Related Technologies

Computers of various kinds are pervasive throughout most organizations. Most of these computers are not much different from devices that you use such as i-phones or x-boxes. They reside in most office automation devices such as copiers, fax machines, telephone and voice mail systems. They provide the infrastructure for facility management (environment, security, and operation). If the firm manufactures products there most likely are special purpose computers for the production line (e.g. numerical control, robots, intelligent agents, handheld scanners/barcode readers, RFID, and mobile computers); for the engineers (Computer Aided Design [CAD], plotters, scanners, and readers); and for the myriad of personnel that directly interface with the customer (workstations, scanners, handheld devices, etc.).

3. Information Technology and the Internet

Information technology — including decision support systems, expert systems and artificial intelligence, virtual offices, voice messaging, on–line transaction processing systems, data warehousing and mining, electronic mail, teleconferencing, and other software-based advances fundamentally changed the nature of the workplace. Foremost was the introduction of the internet. We can think of the internet as a network of networks – in reality it consist of a worldwide set of networks connecting people, businesses, governments, and even nations. There are also variations of the internet such as the intranet and the extranet. The intranet is a subset of the internet that uses the same technology (e.g. web browser and network equipment) and operates solely within the organization's computer network to communicate. The extranet uses Internet technologies to facilitate communication and trade between an organization and its business partners, such as suppliers and customers.

An internet web site can enhance productivity through providing product information, external e-mail, accepting orders, processing orders and payments, and conducting research. An intranet can enhance productivity through internal email, collaborative processing, access to "organizational memory" residing in databases, order processing, personal web pages, departmental web pages, group communications, organizational communications, and product and company information. An extranet can enhance productivity through implementing electronic data interchange [EDI] with suppliers and customers, collaborating with other organizations in developing new products and services, sharing product catalogs exclusively with wholesalers, and sharing news and other information of shared interest exclusively with business partners.

The maturity of the internet and especially the introduction and proliferation of the use of the world wide web [WWW] occurred over a very short seven year period (1995-2002). The WWW changed the way businesses communicated with their customers and suppliers. The "web" became the great equalizer – it didn't matter who you were but what you had to offer. A company can truly be a Mom and Pop operation and no one would know or care. The successes of Dell (on and off the largest provider of personal computer systems), Google, Amazon.com, and e-Bay all illustrate this phenomenon. The web consists of compound electronic documents which are capable of containing rich set of multimedia elements (voice, data,

animation, streaming video) -- almost any element can contain a hyperlink to another part of the document or another document on another web page.

What makes the internet hum is the intricate array of networks connected much like the worldwide telephone system. Each organization has its own internal set of network(s) which are connected to the outside world via an ISP [Internet Services Provider] or some arrangement wherein they lease lines from some commercial carrier. The web has become one of the primary life-line for many firms connecting them to their customers and suppliers. They can also examine and monitor their competitors and the overall business environment.

In many ways the web and the internet are just the tip of the ice berg for businesses. A manager can operate from "nowhere" and "everywhere". Across the breadth and depth of this great mercantile nation, executives and working people can conduct whatever orchestra they wish to in the confines of their virtual space. Being "someplace" is out of date. First there was the cell phone which gave powers land lines never dreamed of. That flexibility allowed any user to be nowhere while talking about anything or nothing. Even more important is the remote handheld device, which for most business people is either the *BlackBerry or the I-phone.* For most of you these are givens but for the typical business person these are dramatic happenings. As late as 1999 it was necessary for a worker to check into the office in person every so often. Now no such contact must take place. With the BlackBerry or i-phone one can do a number of things from nowhere – read and answer email, get interoffice gossip, and even manage subordinates who themselves may be nowhere. There are other tools as well—the fax, voicemail and video which all can be stored and retrieved on the handheld device. The movement of dense storage capacity will permit one's entire life (his music, his books, his emails, voicemails, every business document) to be stored on a single hand-held device by the year 2015 (Scientific American, 2007)
This business revolution in the computer industry was caused by the move to the internet as platform, and an attempt to understand the rules for success on that new platform. The dynamic nature of current network systems promotes a constant innovation of computer products. Where some see the term Web 2.0 as merely a generic buzzword, the computer industry views it as the beginning milestone to an ever evolving inter-net that will continue to foster inter-human connectivity.

Profit, the bottom line in business, is inevitably the driving force behind many strategies and decisions in the workplace. Many business visionaries have capitalized on the shift to online transactions and web sites to compliment brick and mortar business buildings. Upon connecting to the internet, the average knowledge worker is already equipped with the skills to retrieve information, navigate through material, and even contribute to web pages. They do not need instruction when faced with an unfamiliar homepage. Much has been made about Web 2.0 and what exactly this paradigm shift actually means (Wyld, 2008). It has been described by researchers for the Pew Internet and American Life Project as a ''catch-all buzzword'' (Madden and Fox, 2006). Boutin (2006) observed that Web 2.0 is a term that currently encompasses ''a mishmash of tools and sites that foster collaboration and participation''. Nail (2006) characterizes this phenomenon as ''participatory theater'', where ''the principles and technologies of Web 2.0 evolve the user experience from hunting and gathering to creation and social connections''.

The idea of capitalizing on bringing people together online is not entirely new (Enders, 2008). Prior literature has identified various motivations for bricks-and-mortar companies to integrate virtual communities (VCs) into their existing business models. For instance, they can be installed to serve communication, information, entertainment or transaction purposes (Armstrong and Hagel, 1996), to support a company's physical products (Walden, 2000) or to create a single point of access for information within a company (Williams and Cothrel, 2000).

Web 2. aims to enhance creativity, secure information sharing, collaboration and functionality of the web through the use of a medley of tools. These concepts led to the development and evolution of web-based communities and hosted services, such as social-networking sites, video sharing sites, wikis, blogs, and folksonomies. Knowledge acquisition, whether formal or informal, is an inherent social process. Learning is about the collaborative acculturation of persons into a community or network of practices and its knowledge systems. More companies are offering some type of Web 2.0 as corporate applications to their employees. Blogs, wikis and social networking tools used for internal communication, collaboration and knowledge management are being deployed to communicate and collaborate with customers and partners.

The online world largely mimics the offline world. E-mails replace letters, websites make publishing speedier and more effective; data are stored on the user's computer. A collection of programs, paid-for or pirated, are the essential tools for getting going. Web 2.0 has overtaken all of this using the interactivity brought about by wikis (pages that anyone can edit) and blogs (on which anyone

can comment). Data are accessed through the internet; programs are opened in browser windows rather than loaded from the hard disc; instant messages, often attached to social-networking sites such as Facebook, replace e-mail. Web 2.0 also means free video-sharing on sites such as YouTube and free phone calls between computers such as Skype. These developments allow information to be shared far more effectively, at almost no cost.

At the organizational level, knowledge is generated from internal operations or from outside sources communicating with the corporate structure. This includes communication with partners (mostly suppliers or customers). Once created, knowledge is accessed when needed from sources inside and outside the firm. Knowledge is transferred in a formal manner through training or in a less formal way through work–related experiences. Information is represented and conveyed in printed or displayed forms, reports, graphs and charts; knowledge is using the information in an appropriate way. At some point the validity of the knowledge has to be established. After validation, knowledge is internalized within the organizational framework in its processes, systems, business rules, and practices. With the need to maintain a sustainable competitive advantage, critical knowledge cannot reside passively in the minds of employees. It has to be accessed, synthesized, augmented, and deployed. A system has to be employed to use information to the firm's advantage. The organization must learn to employ knowledge rapidly and uniformly. Certain IT innovations have come forward to aid the firm in actively creating and utilizing knowledge to create an intelligent system.

Today's widespread dependence on IT requires more effective knowledge management. Improvements in IT make it easier to collect, store, and distribute information. However, to be effective, knowledge workers need to understand and to act on that information. Knowledge management allows them to leverage their organization's resources to achieve their business goals. The progressive firm today requires some form of an intelligence array of information technologies. These technologies are best described as four IT subsystems: the Enterprise Resource Planning [ERP], the relationship with the organization's vendors (Supply Chain Management [SCM]), the relationship to the organization's customers (Customer Relation Management [CRM]), and the deployment of Business Intelligence [BI] to attain and sustain competitive advantage.

The core of any business is its online transaction processing systems (OLTP). All basic operations of the firm depend on the accurate and timely processing and maintenance of transactions. A transaction usually starts with some interface with a customer or a supplier. On the customer side a customer may place an order or make a payment which would set off a whole series of activities within the firm's transaction processing systems. An order could generate an inventory transaction, an assembly transaction or request, a shipment and billing transaction. After the order has been received, processed and shipped an accounts receivable transaction is generated which results in the issuing of a bill to the customer. The payment by the customer would in turn generate a series of internal and external transactions (Rudin, 1998).

Enterprise resource planning software (Koch, 2007) or ERP, attempts to integrate all departments and functions across a company onto a single computer system that can serve all those different departments' particular needs.This is asking a lot of any integrated system – its pretty difficult to build a software system the really serves Accounting and Finance, Production and Materials Management, and Human Resources. Traditionally these functional areas have constructed their own systems optimized for the particular ways they do their work. ERP systems attempt to combine them all together into a single, integrated software program that runs off a single database so that everyone can more easily share information and communicate.

Today customers and suppliers expect to have access to the same information you as an employee might have—things like order status, inventory levels and invoice reconciliation—except they want to get all this information simply and directly from your company website or maybe even their website. This is e-commerce the front-front end and the back-back-end. E-commerce means your company has to have two channels of access in to the ERP system —one for customers (otherwise known as business-to-consumer) and one for suppliers and partners (business-to-business). These need two different types of information from your ERP system. Consumers want order status and billing information, and suppliers and partners need to be able to plan and anticipate what you need from them. Most ERP systems now offer or interface with Customer Relations Management [CRM] and Supply Chain Management [SCM] in a fashion similar to adding ERP modules(Exact Software, 2005).

To be effective an organization must understand who its customers are and what their value is over a lifetime. The company must then determine what the needs of their customers are and how best to meet those needs. For example, most grocery stores keep track of customer buying habits and trends – they then try to stock the items the customer wants and to advertise and even send offers

to the customers making them aware of related products they might also want to purchase.

The possibilities for using social networking, blogs, wikis, etc. for communication, sharing best practices, building communities and direct or indirect business activities (HR Focus, 2008). Companies can tap emerging global marketplaces to discover and develop new products and services faster and much more efficiently than they have in the past. Social networking numbers among the Web 2.0 technologies help a company foster communication and collaboration (Roberts, 2008). Using any public site as the corporate social network may be a cultural stretch. What should not be a stretch is the use of social networking software controlled within the corporate firewall. Adopters have become convinced that it will bring dispersed workers closer together.

As companies grapple with how, to offer a social-networking platform for their workers, some are realizing that if they don't act quickly their workers will go ahead and do it anyway. That can mean forfeiting control over what content gets posted where, and who can see it. Among the issues is whether to build their own social-networking platform or use an established site like Facebook (Niccolai, 2008).

Science and technology are evolving at such a great speed that even the largest companies can no longer research all the disciplines contributing to their products. Nor can they control end-to-end production processes or retain their most talented people. Meanwhile acquisitions, alliances, joint ventures and selective outsourcing are simply too rigid, and scalable, to drive growth and innovation at a level that will make companies truly competitive (Tapscott and Williams, 2007). Smart companies will treat the world as their R&D departments and use the ideas, inventions and scientific expertise in cyberspace for ideas, innovations and uniquely qualified minds.

Management expert Tom Peters (2001) advocated that all executives practice MBWA – or ‘‘Managing by Wandering Around’’ as a key to unlocking leadership excellence. When this idea was proposed in the 1980s, wandering meant being somewhere physically – in a factory, store or office. Today as anyone wanders around the local coffee houses, universities, parks, streets or their company’s offices, it is evident that more of their lives are being spent online. Thus, to be an effective leader in this environment, the business person too must wander online (Wyld, 2008). A virtual roam around a company or organization is possible with the advent of a host of technological advances – we no longer are just ‘‘surfing the web’’, we engage it by creating and controlling our personal content through user-generated media technologies, while doing this without sophisticated knowledge of computer programming.

4. Final Cosiderations and Implications

Allen (2008) noted in the book, ‘The Wisdom of Crowds’ (2004), author James Surowiecki examined the ongoing woes of the world’s financial markets and drew a parallel with sociologist Charles Perrow’s analysis of disasters such as the Challenger explosion. According to Perrow, Challenger was a ‘normal accident’ – the sort of disaster that, while not foreseeable, is, in a sense inevitable because of the complex and interconnected systems involved. Systems with lots of moving parts are bound to go wrong, and when the parts are tightly linked to one another – as they are in the global financial system – then a failure in one component can cascade through the system. As Surowiecki puts it, ‘the more complicated and intertwined the system is, the smaller the margin of safety’. Web 2.0 tools address these issues in an informal way – a grounds up approach.
Wikis, blogs, group-messaging, software and the like can make a corporate intranet into a constantly changing structure built by distributed, autonomous peers — a collaborative platform that reflects the way work really gets done (McAfee, 2006). Web 2.0 reflects the essence of a new generation of marketing where technology is viewed as empowering communities, not institutions (Cooley, 2007). What is important in terms of corporate adoption is to stop thinking about blogs as a technology in itself, but instead as tactics to empower company workers. Through the aggregation process, they have the ability to deliver the right content at the right time and in the right context. As communication between workers is shifted from email to blogs, the resulting work is more easily accessible and searchable, resulting in a more permanent and user-friendly communications medium. In essence, blogs become a way for individuals to narrate their work and communicate more effectively within their company. Today, a blog receives more attention than email (Weil, 2004). These new technologies are significant because they can potentially knit together an enterprise and facilitate knowledge work in ways that were simply not possible previously (McAfee 2006).

Through entering into the blogosphere with their own corporate blogs, companies are finding that blogging gives a voice to their company in this new medium (Evans and Stroll, 2005). Blogging promotes a new sense of openness with all stakeholders – employees, customers, the public and the media included. Such an environment of openness

is especially valuable in an era of intense scrutiny and an age of mistrust of large institutions (Vara, 2006). The ability of executives and the managers of companies to communicate effectively in the freewheeling environment of a blog are questionable. For blogging executives, the activity requires them to be spontaneous and controversial -- characteristics not typically associated with corporate success.

Any company online site that doesn't keep pace with the demands of users, both inside and outside the organizational boundaries, will fail. Tredinnick (2008) explored the application of Web 2.0 technologies to business intranets and extranets, and their potential use in managing and developing business information and knowledge assets. He noted that Web 2.0 approaches were subtly reshaping the relationship between users and information-- and argues that it is not just a technological innovation, but a change in the understanding of the status of information, knowledge and the role of the user in information applications. As information proliferates, control is being gradually ceded to users, opening up the possibility of a new, more democratic, and evaluative phase in the exploitation of information within organizations.

Web 2.0 represents a shift in Technology to a system of synergistic and mutually supporting techniques and activities for running a manufacturing or a service operation (Levison and Rerick, 2008). The techniques and activities differ according to the application at hand but they have the same underlying principle: the elimination of all non-value-adding activities and waste from the business. There is, too, an ongoing debate around which tools might win the day. It is an environment in which many enterprises are taking up social software applications that were originally designed for the social activities of teenagers and which can, therefore, fall into and out of favor pretty rapidly. The blogosphere resounds to debate about which tool is most useful. In many ways the battle of which social networking site is flavor of the month is less interesting than the underlying behaviors starting to develop, the ways in which people interact and to what end. At the same time, for those who populate multiple networks, managing one's online identity can be a job in itself.

As information turns digital, so organizations and departments are starting to come out of their silos (Braun, 2008). Attitudes are changing, too. The managerial style of the 1990s now faces challenges from newer ideas and what may look like a waste of time within one organizational culture is real work when looked at within another. At the moment it looks as though share and trust are winning the battle against security and privacy. There is a danger of hyping the vision of a Web 2.0 world beyond what is safe for security and privacy. It may even be that personal privacy is already impossible and that governments, corporations and other organizations are going to have to live with a lot less of it in future.

References

[1] Allen, Katherine 2008, "Developing trends and challenges for the information industry examined in the context of the Online Information Conference", *Business Information Review*. SAGE Publications Los Angeles, London, New Delhi and Singapore, Vol 252: 81–85

[2] Anderson, P. 2007, "What is Web 2.0? Ideas, technologies, and implications for education", *JISC Tech Watch*, available at www.jisc.ac.uk/media /documents/techwatch/tsw0701b.pdf

[3] Armstrong, A. and Hagel, J. 1996 The real value of online communities. *Harvard Business Review* 74, 134–141.

[4] Boutin, P. 2006, ''Web 2.0: the new internet ''boom'' doesn't live up to its name'', Slate.com, 29 March, available at: /www.slate.com/id/2138951/ accessed 17 November 2006.

[5] Boyd, D. 2005, "Apophenia: why Web 2.0 matters: preparing for glocalization", available at: www.zephoria.org/thoughts/archives /2005/09/05/why_web20_matte.html

[6] C. Perrow 1967,, "A Framework for the Comparative Analysis of Organizations," *American Sociological Review*,32 pp. 194–188

[7] Cooley, A. 2007. The key to developing maps of the future. from http://www.teleatlas.com/

[8] Eijkman, H. 2008, "Web 2.0 as a non-foundational network-centric learning space", *Campus-Wide Information Systems*, Vol. 25, No. 2, pp. 93-104.,

[9] Exact Software 2005 "Customer Relationship Management: Putting Customers at the Center " . a whitepaper.

[10] Freeman, T. 2006, "Coming of age: an introduction to the new worldwide web", available at: http://fullmeasure.co.uk/Coming_of_age_v1-2.pdf

[11] Hinchcliffe, E. 2006, "Review of the year's best Web 2.0 explanations", http://web2.socialcomputingmagazine.com/review_of _the_ years_best_web_20_explanations.html

[12] HR Focus 2008 "What you should know about using Web 2.0," *HR Focus*. New York: Apr 2008. Vol 85, Is. 4: p. 10-11.

[13] Kast, F. E. and J. E. Rosenzweig, 1985 *Organization and Management: A Systems and Contingency Approach*, New York: McGraw–Hill,;

[14] Koch, C 2008"ABC:An Introduction to ERP", *CIO Magazine*, http://www.cio.com/article/40323/ABC_An_Introduction_to_ERP
[15] Levinson, William and Raymond Rerick 2007 "Manufacturing: Factories of the Future," *CIO*, January 01, 2007
[16] Madden, M. and Fox, S. 2006, ''Riding the waves of ''Web 2.0'', A Report from the Pew Internet& American Life Project, 5 October, available at: www.pewinternet.org/pdfs/PIP_Web_2.0.pdf
[17] McAfee, Andrew 2008, "Enterprise 2.0: The Dawn of Emergent Collaboration," *Sloan Management Review*, Spring, 2008, Vol. 49 No. 3
[18] Nahm, Y.E. and H. Ishikawa 2005"A hybrid multi-agent system architecture for enterprise integration using computer networks "- *Robotics and Computer-Integrated Manufacturing*, Volume 21, Issue 3, June 2005, Pages 217-234
[19] Niccolai, James 2008 "Firms tackle social networking," *Network World*, Southborough: Apr 28, 2008. Vol. 25. Is. 16: p. 24.
[20] O'Reilly, T. 2005. What Is Web 2.0: Design patterns and business models for the next generation of software? http://www.oreillynet.com/pub/a/oreilly/tim/news/2005/09/30/what-is-web-20.html
[21] O'Reilly, Tim 2006"Web 2.0 Compact Definition: Trying Again." O'Reilly Radar. 2 May, 2008 < http://radar.oreilly.com/archives/2006/12/web-20-compact-definition-tryi.html>.
[22] Peters, T. 2001, ''Tom Peters' true confessions: on the 20th anniversary of In Search of Excellence,' *Fast Company*, November, available at: www.fastcompany.com/online/53/peters.html.
[23] Rapaille, C 2007. *The Culture Code*, Broadway Books,.
[24] Rudin, K 1988 "Transaction Processing Today," *Data Based Management Systems*, January 1998, pp. 15–23.
[25] Roberts, Bill 2008 "Social Networking at the Office", *HR Magazine*, Alexandria: Mar. Vol. 53, Iss. 3: pp 81-84.
[26] Rosseau, D. A. 1979 "Assessment of Technology in Organizations: Closed versus Open System Approaches," *Academy of Management Review*, 4, pp. 531–42
[27] Scientific American
[28] Surowiecki, James 2004 The Wisdom of Crowds: Why the Many are Smarter than the Few and how Collective. *Wisdom Shapes Business, Economics, Societies and Nations*. London: Little Brown.
[29] Tapscott, Don and Williams, Anthony D. 2007 "Wikonimics: How Mass Collaboration Changes Everything," *CIO Magazine*, Feb 1, 2007.
[30] Tredinnick Luke 2006 "Web 2.0 and Business" *Business Information Review*, Sage Publications Vol. 23, No. 4, 228-230
[31] Vara, V. 2006, ''Office co-opts consumer web tools like 'wikis' and social networking'', *The Wall Street Journal*, 12 September, pp. B1, B4.
[32] W. A. Pasmore, Designing Effective Organizations, New York: John Wiley & Sons, 1988, p. 51.
[33] Walden, E. 2000 'Some value propositions of online communities. "*Electronic Markets* 10, 1–6.
[34] Weil, Nancy 2008 Web 2.0 in Business; To understand the value, you have to try for yourelf, *CIO Magazine*, June 1, 2008, Vol. 21, Is. 16.
[35] Williams, R. L. and Cothrel, J. 2000 Four smart ways to run online communities. *Sloan Management Review* 41, 81–91.
[36] Wyld, David C 2008 "Management 2.0: a primer on blogging for executives" Management *Research News Vol*. 31 No. 6, pp. 448-483

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