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Web-driven Management Thinking: A Look at Business Process Redesign in the Age of the Web

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Abstract: Traditionally, management thinking has preceded and quite possibly driven the adoption and use of information technologies (IT) in organizations. That is, management schools (of thought) that emphasize certain types of work structures usually appear earlier than IT geared at supporting those work structures. This situation has undoubtedly changed recently, arguably around the mid-1990s, with the explosion in the commercial use of the Internet and particularly the Web. A first step towards a new management framework to help organizations benefit from modern Web-based IT is proposed and discussed in this paper. Our goal is to provide some basic elements that can be used by managers and researchers as a starting point for a broader management model. As such, we focus on a particular set of activities associated with team coordination and communication in production and service delivery business processes. Our framework is based on our experiences in 30 business process redesign projects conducted in partnership with 15 US organizations from 1997 to 2000.

1. INTRODUCTION

Traditionally, management thinking has preceded and quite possibly driven the adoption and use of information technologies (IT) in organizations. That is, management schools (of thought) that emphasize certain types of work structures usually appear earlier than IT geared at supporting those work structures. This situation has undoubtedly changed recently, arguably around the mid-1990s, with the explosion in the commercial use of the Internet and particularly the Web. The emergence of e-commerce, e-trade, e-business, and other *e-'s* has clearly led to creation of new organizational forms, management challenges, and related management ideas. For example, the Web has led to the development or expansion

of the following types of organizations (Ashkenas et al., 1995; Christensen, 1998; Davidow and Malone, 1992; Grudin, 1994).

- "Internet startups", whose market value vastly exceeds what traditional price/earnings standards for company market valuation stipulate, placing these companies in an advantageous competitive position right at their inception due to the initial amount of capital that is available to them.
- "Internet portals", whose market value depends much more heavily on the number of visitors (first time or repeat) they can draw than on their revenues, profitability or other traditional market value measures.
- "Virtual organizations", which operate with no or few physical assets and distribution channels.
- "Boundaryless organizations", in which geographical barriers to teamwork and market reach are virtually eliminated.

The examples above only scratch the surface as far as the potential that this "disruptive technology" which is the Internet can have on organizational structure and, in consequence, management thinking. The adoption of management ideas that are aligned with the collaboration potential afforded by the Internet and the Web can place companies at tremendously advantageous positions in their industries, at least at a certain point in their evolution as organizational entities, as illustrated by Dell Computer, Federal Express, E-Trade and Amazon.com. The reasons for this are many, and range from the capacity to benefit from lower barriers to new entrants, to the ability to attract large infusions of capital at the beginning of their life cycle, to the development and continuous use of highly streamlined distribution and workflow management processes.

This paper proposes and discusses a first step towards a new management framework to help organizations benefit from modern Web-based IT. Our framework is developed based on a broad review of 30 business process redesign projects conducted by us in 15 organizations from 1997 to 2000.

2. NEW ORGANIZATIONAL MODELS SUPPORTED BY THE WEB AND KEY MANAGEMENT SCHOOLS OF THE 1900S

At the time of writing, the type of management thinking discussed in the previous section was not well defined and shaped in the form of a single management school. Nevertheless, is has been easy to find organizations trying to adapt ideas from old and existing management schools to the new environment of Web-based IT. Table 1 summarizes key management schools that emerged in the late 1900s, before the use of the Web became widespread.

Table 1: Key management schools of the 1900s

Management school	**Main figure(s)**	**Period**	**Main thesis**
Total quality management	Deming, Juran	Began in the 1950s, first in Japan, reaching the US in the 1980s	Organizational improvement should focus on processes, not problems, and related quality issues. Productivity improvement cannot be realized without quality improvement. Line employees and customers, not only managers, should be deeply involved in quality improvement initiatives (Deming, 1986; Juran, 1989).
Organizational learning	Revans, Argyris, Senge	Began in the 1960s	Workers as well as managers can continuously improve the organization in which they work by freely sharing and questioning their knowledge and personal beliefs in a trusting organizational environment (Argyris, 1992; Revans, 1991; Senge, 1990)
Excellence	Peters, Kanter	Began in the 1980s	Excellent organizations change continuously in order to satisfy their customers. This change is both top-down and bottom-up, i.e., it is driven by managers as well as line workers (Peters and Waterman, 1982; Kanter, 1995).
Reengineering	Hammer, Davenport	Began in the 1990s	Organizations should radically redesign their processes from time to time in order to remain competitive. This redesign should be top-down, i.e., primarily led by top managers (Davenport, 1993; Hammer and Champy, 1993).

Trying to adapt ideas from old and existing management schools (such as those in Table 1) to the new environment of Web-based IT has its advantages, but is difficult to accomplish in practice. There are two key reasons for this. The first is that some of the new Web-based IT have emerged to support new organizational forms that are often incompatible with one single management school. This makes it difficult to match a single management school with Web-based IT. The second reason is that existing management schools usually propose ideas that are, at some level, contradictory with each other, often because they were developed on the premise that other management schools proposed ideas that did not work in practice

(e.g., reengineering vs. total quality management). Moreover, given the tendency of business writers to focus on one or a few business ideas and propose them as a panacea, it is difficult to find a good match between single existing management schools and emerging Web-based IT. What appears to be needed is a generic framework that ties together relevant management ideas that help organizations strategically and operationally align themselves with new Web-based IT.

It is beyond the scope of this article to propose a new management school. Even "describing" in the detail a new management school would increase the length of this paper beyond the space available. Given this, a first step towards a new management framework to help organizations benefit from modern Web-based IT is proposed and discussed in the next section. Our goal is to provide some basic elements that can be used by managers and researchers as a starting point for a broader management model. As such, we focus on a particular set of activities associated with team coordination and communication in production and service delivery business processes.

3. A SIMPLE FRAMEWORK FOR SUPPORTING PROCESSES WITH WEB-BASED IT

A great deal of our work at the Process Design and IT Group at Temple University's E-Business Institute revolves around the use of IT to support various team-based business processes. Since 1997, we have been working with a number of companies in the Philadelphia Metropolitan Area, the US Department of Defense, and a few defense contractors, in the analysis and redesign of their business processes, leveraging the resources provided by the Web to support new intra-organizational processes through "intranets", and new inter-organizational processes through "extranets". Some of the companies we have worked with toward this end were Prudential Insurance, Metro One Telecommunications, Sheraton Hotels, Day & Zimmermann, Delaware Investments, Penn Mutual and Andersen Consulting. The defense contractors we have worked with were Lockheed Martin and Computer Sciences Corporation.

After several projects, each involving different managers, consultants and key employees, some patterns started to emerge that seemed relatively independent of characteristics of the organization, processes, or people involved. While the organizations and processes targeted had their own peculiarities, we seemed to invariably arrive at a similar final result. This final result was, in all projects, a new process (we analyzed and redesigned over 30 processes from more than 15 organizations from 1997 to 2000). Processes analyzed included marketing, sales, inventory control, production, distribution, service delivery, and procurement. Production, service delivery and procurement processes were among the most frequent types of processes redesigned. In these, some generic features were

particularly similar across redesigned processes in different companies. These are illustrated in Figure 1 and can be summarized as follows:

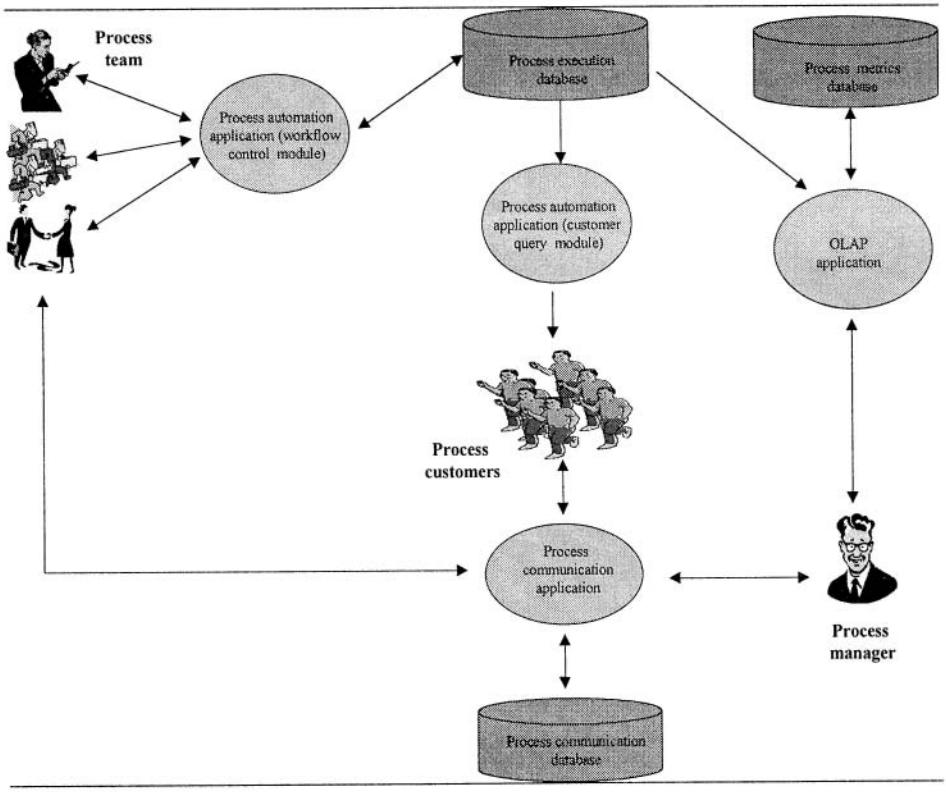

Figure 1. A generic model to implement processes enabled by Web-based IT

A Web-based workflow control module, represented in Figure 1 by the oval described as "Process automation application (workflow control module)". This is a computer application module that automates the execution of a process, from beginning to end, reminding process team members of tasks under their responsibility and allowing them to update the execution status of those tasks. This module populates a **process execution database** that stores data about process execution, represented in the figure by the drum symbol described as "Process execution database".

A Web-based customer query module, represented in Figure 1 by the oval described as "Process automation application (customer query module)", whose main function is to give customer access to process execution status data. For customers requesting an external telephone line repair, for example, this module would provide information about repair status.

A Web-based OLAP (Online Analytical Processing) application, represented in Figure 1 by the oval described as "OLAP application", whose main function is to allow the process manager to generate (and customize the generation of) process metrics periodically. Process metrics provide a simplified view of the productivity and quality of a process and can be used for continuous improvement of the processes.

A Web-based process communication application, represented in Figure 1 by the oval described as "Process communication application", which populates and provides access to a **process communication database.** This application supports continuous communication between the process manager, process customers, and process team and may incorporate the following Web-based components:

- **A repository of summarized process metrics and process improvement initiatives** aimed at improving the outcomes of the metrics. Usually the process manager maintains this repository.
- **A discussion forum** that allows process customers to communicate with each other as well as with process team members and the process manager.
- **A knowledge base** with key data needed by process team members to execute their respective activities in the process, and process customers, so they can use outputs of the process more efficiently and effectively.

4. A PRACTICAL EXAMPLE: A WEB-BASED "HELD DESK"

One of the most common processes of IT organizations that provide technology support to parent companies is the "help desk" process, which is used here to illustrate the generic process framework outlined in the previous section. It is through the help desk process that internal users are enabled to do their work using IT. Help desk activities include new accounts (e.g., email, proxy, dial-up, selected applications) creation, office applications training, general hardware and software support, network cabling set up, and database hosting, among others. The help desk process is a key process for both IT organization and parent company. The IT organization's budget is often defined by the quality and volume of help desk-related services provided to internal IT users.

A practical implementation of a help desk process using the Web-based IT model discussed in the previous section is shown in Figure 2. The relative position and shape of the main process elements is the same as in Figure 1 so that the reader can easily relate generic elements (shown in Figure 1) with their more specific counterparts in the implementation example shown in Figure 2.

In this practical implementation, the user interface is a Web browser (e.g., Netscape Navigator, Internet Explorer etc.) and, as such, is common to all users. All applications are Web-enabled and run on Web servers (or clusters of Web servers).

The communication medium between Web servers and browsers is the Internet (although it could have been an intranet or local area network supporting Web communication protocols). This configuration allows any of the process "actors" (i.e., process manager, process team members and process customers) to use the system anywhere-anytime. Specific implementation elements are discussed below.

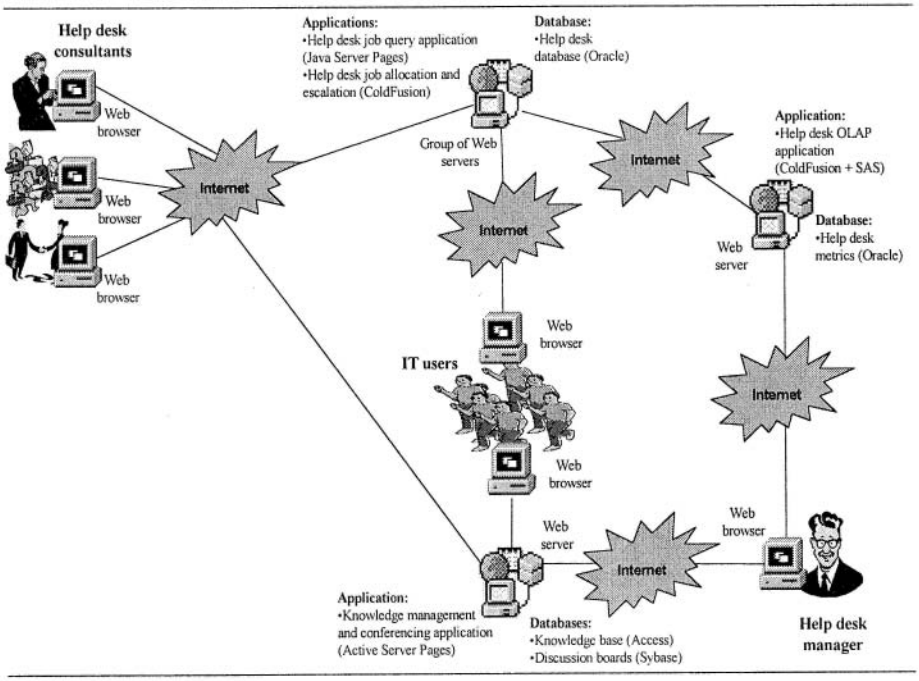

Figure 2. A Web-based "help desk" implementation of the generic Web-based IT model

A Web-based workflow control module, is implemented as a help desk job allocation and escalation application, developed using ColdFusion (a Web development platform commercialized by Allaire Corporation) by a third-party software developer (and modeled after the popular Remedy Help Desk system). This application populates an Oracle **help desk database** that stores data about help desk "jobs" (e.g., requests for support and follow-up activities).

A Web-based customer query module, is implemented as a help desk job query application, developed with Java Server Pages (or Servlets, which are standard pieces of Java code that run on the Web server), which allows IT users to monitor the status of their help desk jobs. This application runs on the same group of Web servers (which could be seen as one large Web server) as the help desk job allocation and escalation application and performs queries against the same help

desk database populated by that application (although without modifying the database).

A Web-based OLAP (Online Analytical Processing) application, is implemented as a help desk OLAP application, developed using ColdFusion and SAS (an OLAP application development platform), that allows the help desk manager to generate (and customize the generation of) help desk quality and productivity metrics periodically. The application populates an Oracle help desk metrics database. Examples of metrics are number of help desk jobs of a certain category (e.g., network troubleshooting) solved within 2 hours of the request for help, number of complaints by IT users, number of help desk jobs handled by a particular individual or group of individuals, percentage of recurring problems etc.

A Web-based process communication application, is implemented as a knowledge management and conferencing application, developed with Active Server Pages (standard pieces of VBScript code – itself similar to Microsoft's Visual Basic language code – that run on the Web server), which populates and provides access to two databases: **an Access knowledge base and a Sybase discussion board database.** The application also allows the help desk manager to post process metrics periodically, which are converted by the application into standard HTML and shown as a series of static Web pages. This application supports continuous communication between the help desk manager, IT users, and the help desk team. It incorporates the following Web-based components:

- **A discussion forum** that allows IT users to communicate with each other as well as with help desk consultants and the help desk manager in a more personal and less structured way than through help desk jobs. This discussion forum also works as a continuous two-way information exchange forum between local IT "gurus" (e.g., a salesperson who knows a lot about a sales IT application and who helps his colleagues in the Sales Department) and help desk consultants.
- **A knowledge base** with key knowledge needed by help desk consultants to execute their respective activities in the process. This knowledge base is also used by selected IT users (e.g., the local IT "gurus" mentioned above) for self-help.

5. LINKS WITH DIFFERENT MANAGEMENT SCHOOLS AND RELATED IDEAS

It is important to stress that the process redesign initiatives that led to variations of the generic model discussed here were guided by a common methodology called MetaProi, which stands for Meta-process for Process Improvement (see Kock, 1999). In spite of this, the fact that the model shown on Figure 1 emerged from process redesign efforts involving different people in different companies is still remarkable. After all, senior management and consultants were involved, and they

agreed that the new processes were either optimal or close to optimal. This convergence is also an indication of the existence of underlying management ideas that are likely to surface if awareness about current Web-based IT potential exists. Further inspection also suggests that even though these management ideas, which surfaced in process redesign discussions, are not tied to a single management school, they are obviously aligned with several schools (as shown on Table 2).

Table 2: Management ideas, related schools and process features

Management idea	Management schools	Process feature(s)
Direct management control on teams should be reduced to a minimum. Process-level control should be automated as much as possible.	Excellence, Reengineering.	Workflow control automation.
Customers should have instant access to process execution status.	Total quality management, reengineering.	Automated customer query support.
Process metrics should be periodically analyzed and used to incrementally improve processes.	Total quality management.	OLAP-based process metrics generation.
Customers should be allowed access to process performance data and related process improvement initiatives, and asked for their advice on how to improve processes.	Excellence, total quality management, organizational learning.	Process metrics and improvement initiatives repository, discussion forum.
Customers should be given full and decentralized access to process-related data so they can solve some process-related problems themselves.	Reengineering, organizational learning.	Process knowledge base.

The "Process feature(s)" column on Table 2 describes features of the generic process model that are highly dependent on IT, particularly in the last two rows (repository, discussion forum, and knowledge base). Those features would not have been present if senior management was not willing to implement the management ideas described in the first column of Table 2, which in turn became more popular with the emergence of four contemporary management schools: total quality management, organizational learning, excellence, and reengineering. Still, one cannot convincingly argue that management thinking is driving the use of the technology. Not only do these four management schools differ significantly from each other, but they also have a different following (e.g., organizational learning proponents often suggest their management school as a "softer" and more "people-oriented" alternative to reengineering). It is more likely that modern Web-based IT

force the adoption of management ideas that do not have a single and coherent source.

The idea that information technology should drive organizational design has been proposed by many business thinkers, including reengineering co-inventor Tom Davenport (1993) – in fact, this was one of the early areas of disagreement between him and other proponents of reengineering led by Hammer and Champy (1993). Yet, letting information technology define how processes are structured shifts a great deal of the responsibility on how to manage organizations to software developers and systems integrators, who arguably do not know the processes of the organizations they serve as well as their (internal or external) customers do. Moreover, software developers and system integrators need to sell their products and services to many organizations in order to maximize their profits, which is bound to decrease potential competitive advantages for their corporate customers. After all, if you have the same processes and enabling technologies as your competition, how can you possibly get ahead of them?

6. CONCLUSION

From a practical perspective, the generic process model discussed above can be seen as an "archetype process", which can be used as a "template" for the design of optimal business processes. After all, it is based on a number of process redesign efforts that led to the same high-level result. Using it may save organizations precious time and resources that would otherwise be wasted "reinventing the wheel".

From a more philosophical perspective, the process model can be seen as a first step in the direction of a new management school. This new school's principles should guide the selection and implementation of Web-based IT to enable optimal processes, rather than the other way around. One of the key concepts underlying this new management school is that of "virtual communities" of process team members, users and managers, brought together in creative ways through the use of Web-based IT. Such virtual communities should, among other things, promote collaboration between customers and suppliers, by allowing them to communicate and share information and knowledge independently of traditional time and distance constraints.

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