ERP BASED BUSINESS PROCESS REENGINEERING IN A HUMAN RESOURCES DEPARTMENT: A CASE STUDY APPROACH

Konstantinos Chertouras

IT Division, "Papageorgiou" Regional Hospital of Thessaloniki, Nea Evkarpia 56429, Thessaloniki, Greece

Theodora Chatzikallia

Dipl.-Eng Mechanical Engineer, Independent Consultant, Drimos 57200, Thessaloniki, Greece

Keywords: ERP, Business Process

Abstract: Modern organizations are constantly facing new challenges regarding the reengineering of their business departments and processes. By the term Business Process we mean the profile of specific methods that can be employed to perform specific business tasks. In general, each Business Process is uniquely tailored to the organization it applies. Therefore, the resolution of a Business Process related problem is typically carried out with custom methods developed within organizations. In this paper we propose the use of Enterprise Resource Planning (ERP), as the basis for reengineering a business department and effectively the Business Process that it carries through. We discuss the application of ERP in the reengineering of the Business Process of a real world organization department (a Human Resources (HR) Department), which lead to a significant productivity enhancement.

1 INTRODUCTION

Business Process Reengineering (BPR) is a relatively new area of the business management scientific field. Business Process is the set of all semantically related business tasks or units, connected to achieve a complex business outcome (Davenport & Short, 1990). Business Processes can be identified in terms of (a) their beginning and end points (where "customers" will ask for services and collect the results respectively) (b) interfaces (through which "customers" will ask for services), and (c) the organization units (i.e. the business units) involved in each process (Davenport & Short, 1990).

BPR methods appeared as the scientific tool, able to perform critical analysis and radical redesign of existing business processes. The rational behind the advent of these methods, is to achieve breakthrough improvement in terms of relevant quantitative (i.e. productivity achieved) and qualitative (tolerance to failures, flexibility) criteria (Teng et al., 1994).

In order to achieve this "radical change", corporations have to employ new technologies to accommodate the complexity of the required reengineering tasks. Information Technology (IT) Systems appear to be a suitable tool for satisfying these requirements (Hammer, 1990) with ERP technology being the most appropriate (Parr & Shanks, 2002). ERP systems possess several key attributes including: (a) Integration (all the different IT systems are interconnected and cooperate transparently) (b) Fault Tolerance (human intervention in data exchange is minimized) and (c) Ease of use.

In this paper we illustrate the key role of ERP systems in the successful reengineering of a traditional business process employed in a real world HR department. In section 2, we set the general problem framework. In section 3, we briefly present ERP systems and the merits they possess. In section 4 we examine, how a business process can be modeled without an ERP system. We then discuss, the major changes that ERP technology brought to the process it implemented at hand.

2 PROBLEM FRAMEWORK

Let us present a real world Human Resources (HR) department, as an example of a business process system. HR departments (as any business unit) incorporate organizational units (Payroll unit, Time Management unit etc.), beginning and end-points (to allow "customers" to access the respective business processes and obtain results), as well as interfaces (perceived as the instructions on how to get results from the business process).

An HR department is responsible for the following: 1. Personnel Administration (PA) and Organizational Management (OM). 2. Constant monitoring of all kinds of paid and unpaid leaves. 3. Shift planning, individual work schedules, time management and time evaluation. 4. Payroll and benefits remuneration.

Taking all these factors into consideration demands for a highly complicated business process. Furthermore it is desirable that the business process operates with as little manpower as possible. In the majority of cases, a traditional business process is employed to solve such problems. In this approach, a set of rules is compiled to cover for different scenarios that may arise in everyday business life. Furthermore, responsibilities are assigned among the members of the HR team in order to implement the business process.

The above procedure is error prone since it is based solely upon the human factor. The solution is to decouple the business process needs from the human factor as much as possible. This is where Enterprise Resource Planning technology (ERP) is ideally suited. Through the use of ERP systems, we can project our business needs, rules and responsibilities, into an integrated platform that will allow a fully computerized approach, which will prevent a great number of common people mistakes.

In the next section the most important aspects of ERP systems technology are presented.

3 ERP SYSTEMS OVERVIEW

Enterprise Resource Planning technology provides a unique Information Technology (IT) platform to cover all the business needs of a corporation (Gattiker & Goodhue, 2002). Despite their deployment complexity and cost (Griffin, 1999), ERP systems became very popular due to a unique property they exhibit; Integration i.e. the ability to handle all parts of a business process as a coherent whole. Before ERP systems came to life, an organization had to employ a variety of different systems to cover its IT needs.

These systems have been functioning as standalone platforms, and there was not any easy way to exchange data and expertise among them. People were responsible for data migration from one system to another to allow for system interoperability. Furthermore, in order to cover for different working positions within the company, company personnel had to be completely retrained to be able to use all these different systems.

ERP technology came to change all these. Through ERP systems technology, companies have a single platform to accommodate all the key business parts. Data integrity and user level security are easily achieved, facts difficult to handle with multiple software platforms. Moreover, ERP systems allowed the processing of all commercial and business functions, regardless company's size and geographic location of the company's components (Parr & Shanks, 2002). Integration is the key to this success. Integration, in this context, is the sequence of events triggered by a user action, without the user being informed about the details of these underlying events (Myerson, 2001).

4 NON ERP SYSTEM BUSINESS PROCESS APPROACH

In this section we describe a business process modeled and deployed in our HR department without the use of an ERP system. We will use the term "traditional" (as was explained earlier) to describe the non – ERP business process implementation approach. Such a system can be modeled easily with the use of a directed graph. In this graph, each node (denoted by N_i where i is the i-th node representing a specific business task, e.g. the node labeled N_{OM} is the node assigned the OM position) would represent a different, well-defined position within the business environment, having a predefined role. We assume that every position N_i, is held by a single employee. We use the terms node and employee interchangeably. Furthermore by referring to a node N_i we also refer to the employee accomplishing this business task. E.g. in our HR model, there would be a distinct node, and thus a distinct person to cover for the PA position, for the Time Management (TM) position for the OM position and for the Payroll position (PR) as shown in Figure 1 (next page).

The graph of Figure 1 consists of a set of nodes interconnected in order to accomplish the required business process. The numbers {1,2,3,4} are indexes denoting neighboring nodes. The term $(1 - \rho_1)$
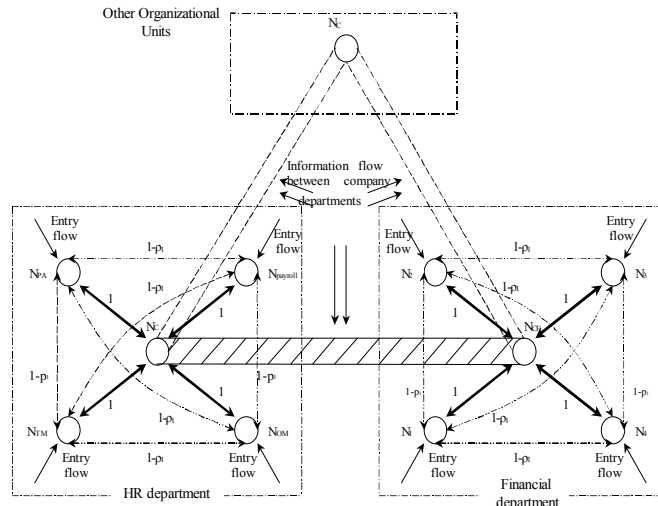
Figure 1: A company operating with non-ERP business logic.

denotes the mean value in the loss of information during information exchange between them (since the value 1 represents loss-less information exchange), a fact that we will shortly explain.

Entry points of "customer" requests are all the peripheral nodes N_i, while central node Nc does not accept input directly from any "customer" (but it accepts input from other central nodes of the same company). Consider for example the case of an employee asking for a paid leave (from node N_{OM}). If the Time Manager is present, then the customer's request will be redirected to the Time Manager. If he/she is not present, then the organizational management responsible will try to accomplish the business task under the guidance of Nc.

In this graph a number of keynotes apply:

1. The total number of nodes depends on the number of posts within the working environment. There is a central node Nc assigned the role of the coordinator (manager). Every node is communicating with Nc and exchange of information is taking place among them. Node Nc accepts input from peripheral nodes, it processes it accordingly, and produces a certain output, as a sort of error correction feedback. The information transmitted back as output to the nodes, ensures (in the equilibrium state – after the error correction procedure terminates) that the actions of nodes are correct. A fundamental assumption is that Nc is totally aware of the correct business process, and that is why the feedback it produces is considered reliable. Furthermore we assume, that there is a one to one communication between Nc and all the other nodes, therefore there is no information loss in the information exchange that is taking place (In Figure 1, solid lines represent the information exchange among each of N_i node and Nc). Effectively, we consider that due to this direct communication, the two parties are able to

completely understand each other. On the other hand, we will shortly examine why the information exchange among all other nodes is considered noisy.

2. There is information exchange among the peripheral nodes of the system in order to handle the tasks in case of an expected or unexpected leave of a business node (In Figure 1, dashed lines represent the information exchange among N_i nodes). Effectively, each node establishes communication with its peer (interdepartmental), nodes. However this communication is fractional and an amount of business detail is lost (this is where noise is introduced). This occurs due to the following facts: a. Each node is aware of some attributes of all others' nodes tasks but it is not fully aware since it is not its main responsibility (obviously, it is nearly impossible for an employee to remember all the details and business facts of a position, if this position is not is his everyday business life). In addition, people avoid getting assigned constantly new tasks and responsibilities since they try to distribute the total workload equally among them. Effectively, people feel that learning to perform efficiently other people tasks and responsibilities may increase their workload (McGregor, 1960). b. Human behavior, human likes and dislikes, as well as personal preferences does not allow for a full understanding of neighboring nodes interaction (Kinney, 1993).

3. In case of a node failure, Nc can become overloaded. All the business tasks of the missing node(s) that cannot be accomplished by its (their) neighbors would be redirected to Nc in order to keep the business process functioning. There would be performance degradation, since the total workload of Nc would increase due to two factors: a. Pending customers for the missing nodes which would be redirected to Nc - since peer nodes would be unable to complete the requests. b. Internal

requests by all other departmental nodes, trying to accomplish pending requests initially targeting any of the missing. Effectively, there is a strong case that neighboring nodes will try to accommodate requests initially targeted for any missing node, without being able to do so (in their effort to relieve N_c from excessive workload). Consequently, they would not redirect these requests to N_c . As a result of their ignorance regarding the correct business process, they would constantly request for details in the form of N_c feedback, and effectively increase further its workload.

4. In case of failure of the central node N_c , the following issues arise: a. There is a global coordination loss in the business process. Business tasks, outcomes and general quality of business service, employees responsibilities and tasks assignments, and all general management tasks, continue to operate unattended and without coordination by the central node N_c . Entropy, as an uncertainty measure of outcome quality is dramatically increased. b. There is no error correction feedback offered to peripheral nodes N_i . Effectively, no error-free state in the business product is reached. Business process final products offered to customers are severely affected regarding their respective quality. c. Noise, as a measure of interference added in the transition of information between the nodes is increased. E.g. for node N_{PA} to transmit information to node N_{OM} , flow has to transit through intermediate node N_{TM} . Since the information exchange between peripheral nodes is incomplete, the error inserted in the transition is propagated and added as shown next: Total Error = Error $N_{PA \to N_{TM}}$ + Error $N_{TM \to N_{OM}}$. d. Connection and information exchange with all the other business units within the organization is lost. Only N_c , the coordinator node, is assigned the task to exchange information with other business units. If N_c becomes unavailable, a significant problem concerning interdepartmental business coordination, among business units, arises.

5 ERP BUSINESS PROCESS

In the previous section, a traditional business process and the parameters that control its behaviour have been presented.

In this section we consider the same business process, with ERP being an integral part of its operation. In the ERP business market a great deal of software packages are present. Market leaders include SAP/R3 from SAP AG (the platform we are employing), PeopleSoft from PeopleSoft Inc, Oracle HRMS from Oracle Corporation and iBaan from

Baan Co to name but a few (Piszczalski, 1997). Figure 2 (next page), shows the business process after reengineering it to accommodate the use of ERP. In order to obtain a better insight on the reengineering let us take as an example the Time Manager and the way it conducts its business tasks using a proprietary IT system. Such a system possesses the following capabilities: 1. Ability to maintain for each employee only its full name and its ID card number as master data. Through the ID card number, the Time Manager has to understand to which company department the employee is working. 2. Ability to maintain a monthly time line for each employee, presenting for each day the employee's working status (absent or present each day). 3. Ability to retrieve data from the corporation's monitoring clocks about the entry and leave time of each employee. The Time Manager had to keep track in a paper full manner of the following: 1. Shift planning of each company department in order to compare employee's entry and leave time with planned working time. 2. Organizational status of each employee within the company, in order to assign a correct working plan based on its position. 3. Up-to-date personal details (master data) of each employee for the correct assignment of working time for each case (i.e. handicapped people should work less etc). 4. Overtime hours of each employee in order to inform correctly the payroll unit. 5. In addition, Time Manager is responsible to correct mistakes and cooperate constantly with the department manager about problems regarding late arrivals, sicknesses leaves etc. The aforementioned issues had to be handled with a system able to perform only the trivial, previously mentioned, tasks. To make clearer the difficulties that the Time Manager had to confront with, let us present the tasks that had to be performed from him/ her in case of a temporary leave of an employee: a. The Personnel Administrator should first ask for the approval of the HR Manager (HRM) to remove the employee from the company's workforce. b. The OM manager should arrange all the necessary reassignment and inform both HRM and Personnel Administrator about the employee chosen to cover the vacant position. c. Payroll should be informed of the changes and to accordingly produce a new payroll scheme based on the new tasks. d. Finally the Time Manager should re-evaluate and reorganize its shift plans according to the capabilities and personal details and preferences of the employee assigned to the new post.

The employment of the ERP system (SAP R/3 in our case) allowed for several enhancements and effectively resulted in a significantly better system performance.
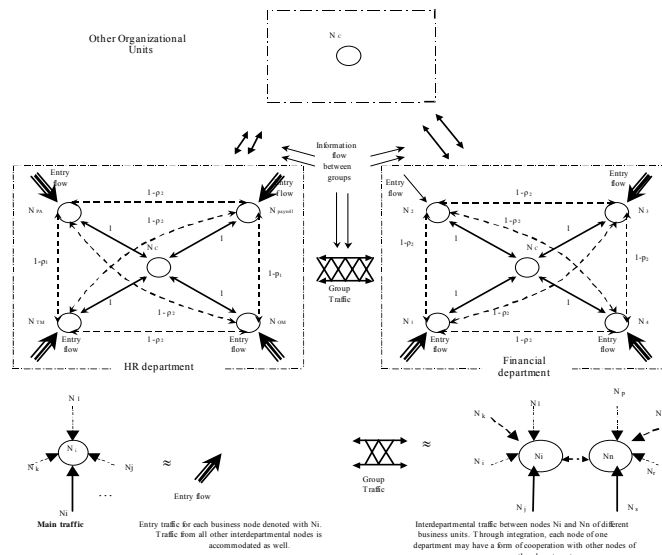
Figure 2: A business department reengineered with the employment of an ERP system.

The following keynotes apply:

1. There is a considerable increase in both the quantity and the quality of information exchanged among neighbouring nodes. After ERP deployment, a single IT platform has been installed and customized in order to accommodate all the business process tasks. Through the customisation procedure, corporations are allowed to customize the deployment of the ERP platform to a sufficient level of detail, to meet their specific business needs. This single platform exhibits two important attributes that enhance information exchange:

a. A common Graphical User Interface (GUI) environment used in all business parts of the system. Through a common GUI interface, users can perform a variety of tasks without the need to know a number of completely different platforms.

b. Integrated cooperation of all the business modules of the IT system. Effectively, employees are allowed to work within the limits of different business process areas, without the need to be aware of the underlying business details. For example, a change in the OM module could trigger a change in the TM module. Thus the employee responsible for the OM module could potentially perform TM tasks. Transparency is achieved as well: after the reengineering, "customers" can be served by more than one beginning and end point. Effectively, ERP technology helped employees to reduce the overall assigned workload and interpersonal contact for trivial business issues, facts that were sometimes the source of interpersonal problems.

2. The total workload of central node N_c is reduced significantly. In the non-ERP business process approach, N_c had an important role in the coordination of all of its assigned business nodes. After the deployment of business logic within the ERP platform, N_c is granted the duties of a customizing ERP consultant. Moreover, N_c lost its role as the business process problems solver. This means that N_c, is now the central source of business knowledge during the ERP deployment phase and the embedding of new methods and enhancements regarding business logic into the ERP system. And since business processes adhere to a well-defined path after the employment of ERP technology, fewer problems appear and less workload is assigned to N_c. N_c retains its role as a central coordinator, without being concerned with trivial business tasks.

3. The property of integration shields the overall system against temporary node failures. This is due to the fact that all the business nodes are aware of all business process tasks, and can accomplish partially the duties of the failed node.

4. Requests from "customers" for any kind of business task can be accommodated by a number of different servers. In the non-ERP business environment, there is a key person responsible for each business component (Personnel Administrator for personnel data, Time Manager for time evaluation etc). After the reengineering, a number of people are capable of performing the same tasks (to a certain extend, since only the responsible employee for each post is totally aware of all the tasks of its assigned post). For example, Time Manager can update personal details; Personnel Administrator can inform about remaining paid leaves quotas; Organization Manager can update payroll by changing the organizational status etc.

5. In the ERP based system, it has become easier for departments within the same organization to exchange business information. E.g. the Materials Manager (part of the Materials and Warehouse department business process) could reduce the salary

of another employee (part of the HR department business process) by a certain quota, if this employee was found in debt in materials.

6. The aspect of the business process on which the introduction of ERP had a significant impact is consistency. With ERP, it is harder for an employee to enter invalid data since error handling is embedded. E.g. consider the situation where an employee was on a paid leave from the Time Manager and the payroll employee was trying to approve overtime hours of work for that day. Without ERP technology, this class of conflicts would be highly possible due to the absence of integration of individual departments.

6 CONCLUSIONS

Having examined thus far the traditional business process approach and the reengineering achieved after the employment of an ERP system, a number of conclusions obtained about the superiority of the ERP based solution, summarized in the following: 1. Increased the system's fault tolerance in case of business nodes failures. 2. Increased the performance achieved in terms of the number of business process requests that can be served at any given time period. 3. Allowed better interdepartmental cooperation through the use of the same unified IT – ERP platform by all team members. 4. Significantly decreased errors in the business process. 5. Decreased errors in the information exchange among business nodes. 6. Significantly reduced the workload of the Central Coordinator Node Nc . 7. Allowed easy adaptation of new business methodologies by using standard software engineering procedures.

7 SUMMARY

In this study we have outlined, how a corporation could enjoy significant benefits from the use of ERP technology. Specifically, through a case study HR business department, we have shown that ERP systems could bring a revolution to the way business processes are implemented compared to traditional paper full and proprietary IT systems implementations. Moreover we have shown that ERP technology, allows the pure computerization of a corporation's business processes, a fact that provides significant performance advantages and economic merits.

ACKNOWLEDGMENTS

REFERENCES

Davenport, T.H. & Short, J.E., 1990. The New Industrial Engineering: Information Technology and Business Process Redesign. In *Sloan Management Review,* pp. 11-27.

Grover, V.J., Kettinger S.R., & Teng W.J., J.T.C. 1995. The Implementation of Business Process Reengineering. In *Journal of Management Information Systems*, 12(1), pp. 109-144.

Hammer, M., 1990. Reengineering Work: Don't Automate, Obliterate. In *Harvard Business Review*, pp. 104-112.

Myerson, J.M., 2001. *Enterprise Systems Integration, Second Edition.* Auerbach Pub., ISBN 0849311497.

Griffin, J., 1999. Information Strategy: Where's the Beef? In *DM Review Magazine,* July 1999, US.

McGregor, D., 1957. The Human Side of Enterprise. In *Adventure in Thought and Action*, Proceedings of the Fifth Anniversary Convocation of the M.I.T. School of Industrial Management, pp. 23-30.

Kinney, J.A. & Johnson, D.L., 1993. Breaking Point; The Workplace Violence Epidemic and What to Do About It. In *National Safe Workplace Institute, 3008 Bishops Ridge, Monroe, NC 28110 (704) 289-6061)].*

Gattiker, T. & Goodhue, D., 2002. Organization Structure and Enterprise Systems: An Empirical Study of Intra Organizational Interdependence and ERP Impact. *www.terry.uga.edu/~ekarah/goodhue.doc*

Parr, A.N., & Shanks G., 2002. Taxonomy of ERP Implementation Approaches. In *Proceedings of the 33rd IC on System Sciences* Hawaii 2002.

Piszczalski, M., 1997. Lesson's Learned from Europe SAP Users. In *Production,* Jan, 109:1, 54-56.