Mapping out of Business Processes for Information Administration based on the Strategy of Organization : A Case Study

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Abstract

Information systems have been substantially gaining a strategic role in organizations. With constant changes that business environment has had, there are no more paradigms that last for a long time or that are not susceptible to changes or even that cannot be defeated. The idea is to establish ways of structuring, integrating and improving Information Systems (IS) in order to turn them suitable to business necessities. The pattern becomes a vehicle which transforms the business strategy into IS strategy. Information starts to be managed on a business process basis and not on a individual or departmental one. This enables management to gain a general view of business and be able to take multifunctional decisions. The Planning Pattern has been applied to a cardboard industry. As a result, a complete mapping of Business processes was conducted besides the application of a Information Architecture, which will attend the processes.

Key words: Information System Planning, Information Architecture, Prioritization, Processes Engineering, Business Process Mapping, Paper Industry.

1. Introduction

The constant concern of an organization has always been conquering and keeping its clients. In order to make this possible there's great effort for innovation and improving the current processes, such as the creation of new products and services that will satisfy customers. Inside this context, enterprises need to search for methodologies that aid and support this growth, organization and structuring, which are essential for a changing process with the main goal of obtaining the results expected by the organization. Besides the methodology, another successful factor is the good management related to the jobs of the organization's executives and the implementation crew.

Experiences in the last decades, where the great investment in information technology was focused on operational and technical aspects, have not produced the desired results. The productivity and income didn't have an improving performance which corresponded to the financial investment. The individual view of different departments was prioritized in relation to the view of processes, which integrates all the enterprise and whose objective is its results.

The age of information itself was left behind. An appropriate planning is demanded so information can be a gathering factor inside organizations; a planning that provides a global view of the entire organization, enabling the integration of its processes aligned with the enterprising strategy, in order to construct a support that is appropriate and necessary to decision taking.

Authors such as Amaral (1995) and Furlan (1991) consider information system planning a consisting part of the organization's strategic planning activity, considering its importance.

For Furlan (1991), the planning of information systems must initially define business before the development and establishment of the systems, considering its critical factors such as basic rules. The planning is also a chance to identify problems and opportunities of the informational environment.

Amaral (1995) claims that the planning of information systems inevitably results in changes in the organization, which mainly appear in human, technical and management resources and obligate them to think over the organization, to wish accompanying the organizational evolution and innovation and to create a spirit of change and search for quality. Such changes reflect the unreachable results of information systems planning.

The goal of his article is to present a case study that used the IBM – BSP (*Business System Planning*) methodology, over what the proposed pattern is based on, having as a premise processes that have been mapped and structured. The work focuses on a company that produces duplex cardboard for containers in the region of Paraná. It tried, by using its own resources, to establish its new processes for the implementation of an Information Architecture which gave support to the management strategy.

2. General view of Methodologies for Information Systems Planning

In the mid 70's IBM realized the necessity of a system planning approach, which viewed several areas of an enterprise on an integrated way, based on business necessities and not on isolated areas. It was created then the BSP methodology – *Business System Planning*, an approach of systems planning concerning the enterprising business and oriented to high administration (IBM CORPORATION, 1981).

According to Torres (1989), there are countless techniques described in books that derive from this initial approach of IBM, such as PROLAN – Planning Program and the APX – *Account Planning Extended*.

Burroughs Unisys developed a methodology named PAC (PSK) – Planning Supported on Knowledge, whose essence is an objective analysis of the enterprising necessities, with priorities determined by the high management. It has the same approach as the BSP from IBM (TORRES, 1989).

Watson *et al.* (1995) considers the idea of conception and development of managing information system by evolution approach and prototyping the most appropriate, even not talking about systems of supporting to decision in small electronic plans and stanch database and inexpressive amounts anymore, but about complex management systems based on huge data bases, sophisticated tools such as EIS and big efforts of development. Its conception and establishment must develop gradually. The literature concerning systems supporting the decision carefully approached the issues of development of systems of support to nonstructural problems.

Methodologies based on data modeling launch from a structure of operational database, that is, databases generated from the operations of the enterprises towards the structuring of a base of managing data. It's an approach that has been used in the conception of *data warehouses* (STREHLO, 1996). They assume that from the providing of a big amount of data on all the necessary managing information will also be provided. However, excessive data will be provided and not enough information. We have found managers in enterprises who complain about excessive information. What

they probably have is excessive data, mostly available through sophisticated tools with graphic resources, but very few information. A research issue would be the empirical observation of the intensity of utilization of the EIS systems that have been developed based on a data orientation. It's likely they are little used.

EI (IE) (Information Engineering), another approach that proposes a joint view of planning, analysis, project and construction of information systems, over the organization itself, or in its segments. Far from being just a methodology, this approach is identified as a class of methodologies that have basic characteristics, such as: *top-down* view, aligning with the strategic objectives and the systems integration, besides the use of automatic tools (CASE – *Computer Aided Software Engineering*) (MARTIN, 1991).

Another methodology is BIAIT - *Business Information Analysis and Integration Technique*, it presents seven independent key issues, which give origin to the typical structure of information systems according to the kind of organization. Although quite simple this technique has a weak point when it doesn't consider the specificity of each organization, which might cover their competitive subtleties that are searched in the investments of information technology (TORRE, 1989).

Yet the FCS (CSF) – Critical Success Factors – approach, which is one of the most recent ones, focuses on the identification of individual necessities of information systems and high administration, viewing the possible applications from the results expected from the organization on. (TORRE, 1989).

Defined by Rockart (1979), the critical success factors are useful for the identification of individual demands of information systems. The approach focuses on the necessity of a list of crucial and analytical information that are not easily available, but that could become available through efforts for system development. Thus, the evaluation of critical success factors is the first effort of the approach. Instead of being in the data or processing, as in the growth stage and total study approaches, the focus of the FCS approach considers the fact of net communication.

The most relevant objective and the benefits of the aforementioned methodologies are based mainly on a *top-down* view, which enables an integrated planning of the systems with the participation of the high administration (ALCOFORADO, 1997).

Connected to the integration concept is still the CIM philosophy – *Computer Integrated Manufacturing,* which is turned to the integration of productive systems through the application of many kinds of computer-assisted tools, such as: CAD - *Computer Aided Design*, CAE -*Computer Aided Engineering*, CAPP - *Computer Aided Process Planning*, CAM - *Computer Aided Manufacturing* e MRP - *Material Requirement Planning* (ALCOFORADO, 1997).

The proposal of CIM implantation goes through a bigger concern, from the strategies of a integrated production system on, through a functional and organizational restructuring of processes, so the project and implementation of systems can begin (CAULLIRAUX, 1995).

For Santos & Contador (2002) the planning directives of information systems are more inherent from managing and behavioral aspects than from technological ones. The directives currently in use are a lot more influenced by corporate managing characteristics than by distinctive technological possibilities.

The ERP concept – *Enterprise Resources Planning* is currently in use, which even being wider than the MRP one, approaches all information necessities of the endeavor in an integrated manner, enabling its adaptation according to the particular characteristics of each enterprise. Among them are incorporated financial, human resources, project, operation, maintenance and sale information.

3. Business System Planning Methodology

The BSP methodology - *Business System Planing* from *IBM Coporation* (1981) is a system that try to demonstrate how Information Systems (IS's) must be structured, integrated and implemented in order to attend the business necessities. This way, it can be seen as a vehicle that transforms business strategy into IS strategy (ALCOFORADO, 1997).

Another relevant point of this methodology is the possibility of integration with other techniques that may serve as a complement or even substitute established stages, such as the incorporation of Strategic Planning (ALCOFORADO, 1997).

The critique by Jackson (1986) refers not to the BSP providing of detailed methods for the implementation of databases and systems, being consequently dependent on understanding and ability of administrators is refuted by Alcoforado (1997), who recommends the BSP utilization for providing an action plan that is able to indicate and prioritize projects connected to the organization's goals. For the implentation of the ISs, it is necessary to search for techniques that are not based on the BSP, but for other data modeling techniques that are widely divulged and utilized by organizations.

BSP is composed by two phases: the first one concerns to strategic issues about the enterprise, its environment its relationship with other entities, such as clients, providers, syndicates, banks and others. Its main product is the mapping out of the internal processes of the organization, trying to identify activities that gather value to the final product of the enterprise and an action plan containing directings for the ISs; and the second phase concerns to introduce managing techniques of database besides providing a more detailed plan (ALCOFORADO, 1997).

According to Porter (1989) the methodology starts with a study of the organization in order to obtain its strategic view in case they are not available. Based on the mission and on the strategic factors the Business Processes Engineering starts. This stage aims to obtain processes related to its final product and clients, giving to the crew a strategic view, which is necessary to the structuring of the processes, enabling to achieve cooperative data and generating an architecture of information focused on the organization's Strategic Planning. The strategic factors are associated to the processes and transferred to the information gathering.

The third stage concerns Information Engineering, which is divided in three phases: establishing of corporation data, modeling of the system and, finally, its prioritization. Initially, the processes and data are defined in a way to establish the architecture of the information system. Based on these corporation data and on the processes of the organizational area, the information gathering is had and it allows establishing the modeling of the system, also considering the types of information systems: transactional systems, information managing systems, decision and supporting systems, among others.

The criticizing aspects of processes in the operational view are equally transferred to the information gathering. Based on the view of the system, through the information systems modulations (ISMs) it is possible then to establish an analysis for the indication

of the systems that have greater impact in the organization and consequently obtain the prioritization of the IS. In the last stage an Action Plan is obtained and it determines based on the priorities established by the Information Engineering and the analysis of the involved technologic platform all the projects to be developed and the necessary resources(*IBM COPORATION*, 1981), according to what is shown in Figure 1 below.

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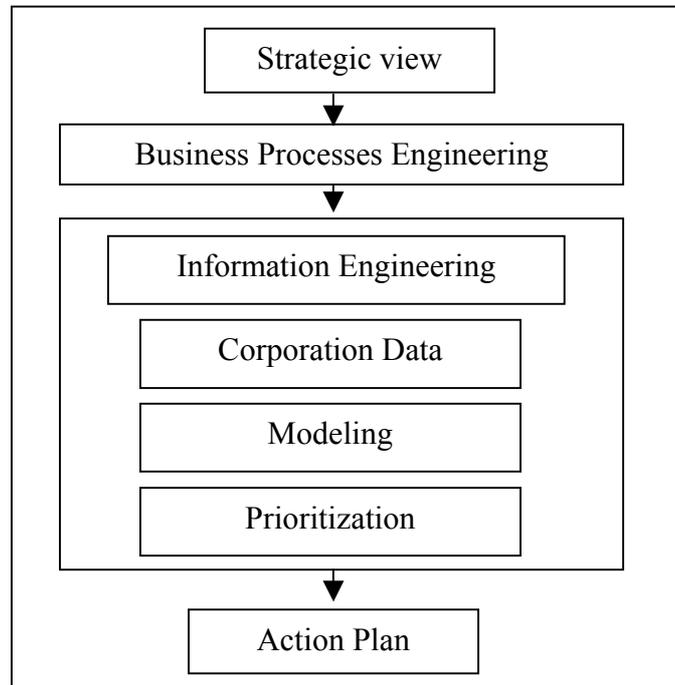
Figure 1: BSP Methodology (*IBM CORPORATION*, 1981)

3.1. The enterprise's functional view

In the planning stage it is extremely important to perform an analysis of the Enterprise's Functional Model. This functional view must be displayed in a diagram of corporation functional analysis, whose functional elements of the enterprise will be structured in an hierarchy, having the enterprise itself as a base and from that on its Functional Areas, Managing Processes and Activities.

3.2. Functional Analysis

In the macro view of the Information Strategic Planning, the Corporation Functional Model launches from the identification of the enterprise, which will be the base of the hierarchic diagram. Presenting latterly two subsequent and interdependent levels, which are represented by Functional Areas and Managing Processes.

The Functional Areas must be considered as Resources of the Enterprise and are directly related with the enterprise's lasting. Its identification may be obtained according to what is illustrated in Figure 2 below:

Resources Functional Areas	Financial	Human	Materials	Equipment	Marketing	Product	Administrative	Technologic	Information
Financial	*								
Human Resources		*							
Supplies			*						
Production				*					
Advertising					*				
Sales						*			
Administration							*		
Product's developent								*	
Computer resources									*

Figure 2: Matrix of Functional Areas Identification (FURLAN *et.al.*, 1988, p.76)

The Functional Areas will be displayed in the second level of the functional diagram and the enterprise will be shown as the base in the first level.

After representing the Functional Areas and the Enterprising Functions, a new stage of functional analysis is launched, where the Managing Processes are identified. These Managing Processes are identified through the lasting of each Functional Area, where they must be identified in the activities performed by the specification, achievement, administration and non activation of the referred resource. The Managing Processes, in the same way as the Functional Areas, support the enterprise's foundation.

After the establishment of the life cycle for each resource generated by the organization, it was possible to obtain a table, which features the main classes of corporation data generated and used by the processes. Those data classes were obtained by the analysis of the life cycle of resources, by verifying the information that moved between one process and another and its integration with other processes and entities administrated by the enterprise. In this stage it was possible to conclude that a data class is only generated by one process, although others use it.

At last, an Action Plan must be elaborated with the establishment of priorities through benefits and impacts previewed by the IS determined by the diagram study developed for each process identified in the life cycle of each resource generated by the organization, as well as determines the structure of *hardware, software* and human resources involved and the projects to be developed (ALCOFORADO, 1997).

In relation to human resources, every type of activity to be performed is detailed in the context of the utilization of Information Systems. Based on the definition of new roles to be developed, the requirements related to each of these additional roles are defined in a way to orient the establishment of training actions and necessary professional development. Besides, an estimation of human resource quantity is done in order to develop the permanent activities related to Information Systems, respecting the deadlines in which the conclusion of the projects is expected (ALMEIDA & ALCOFORADO, 1996).

4. The Enterprise

The enterprise will have the cognomen of Alfa Enterprise, which was, until 1991, the main integrant of a group of companies that had business of several kinds in the state of Paraná. However, the development in the sector of paper and cellulose, allied to great income, made their stockholders gradually concentrate in the production of cardboard.

Besides, Alfa Enterprise already had very favorable factors for the production of cardboard: its excellent location in strategic terms concerning both the sources of material (wood) and the exporting market (Argentina and other countries of Mercosul); the availability of its own wood and the existence of its own hydroelectric resources, which provided it with over 5MW of energy, a quantity that is enough to attend the current demand of the card industry and the integrated unit of mechanical paste.

An enterprise totally controlled by Alfa Enterprise, the Beta Enterprise, is the wood enterprise responsible for the furnishing of material (wood logs) and fertilizers (energetic material, which were obtained in areas owned by it or others.

The activities of Beta cover the administration of reforestation areas (mainly Pinus), which are owned by it and are distributed in several farms in areas of over 8,1 hectare and are located at up to 100km from the card industry.

Besides conserving the existing areas, the enterprise invests annually resources in reforestation and acquisition of new areas, aiming to guarantee the self-furnishing of future enlargement of its productive capacity.

The way it should be kept, at long term, the aptitude of the region for activities related to wood commercialization, the Alfa Enterprise will have guaranteed the availability of the wood that will enable the attendance of demand improvements from future enterprise's expansions, including those that are of big portage.

5. Mapping out of Business Processes for the Administration of Organizational Information

The Alfa Enterprise tried to implant BSP with the main objective of establishing an Architecture of Information that allowed business managing, focusing on activities that could aggregate value to its final product and that enabled the identification of activities and/or resources that were not reaching the objectives proposed by the organization. The following step was the structuring of its processes, following the stages proposed by the methodology:

- Discussion of the enterprise's business;

- Analysis of resources generated by the enterprise (Financial, Personal, Material, Product, Technology/Equipments, Information);

- Elaboration of a model of resource management based on the flow of information and on the life cycle applied to the resources (Specification of necessity, Achievement, Application/Administration and Non activation);

- Comprehension of the concept of processes applied to resources;

- Identification of processes;

- Definition of processes;

- Identification of data classes;

- Definition of data classes;

- Elaboration of the information architecture;

- Prioritization of the information systems;

- Definition of na Action Plan.

The processes identified and defined for the human resource treatment of Alfa Enterprise were taken as a pattern:

1. Process of Personnel Specification:

   It is the process that accomplishes the hiring based on activities of recruiting and selection;

2. Process of Personnel Administration:

   It is the control process applied to hired and non activated resources;

3. Process of Attending Personnel Necessities:

   It is the process that identifies, formulates and implements alternatives that attend to education, training and benefit necessities.

For the determination of the processes defined above, a diagram was elaborated and allowed an analysis of the activities developed in the treatment of the resources generated by the enterprise. This way it can be identified in Diagram 1 the stages previewed by the methodology applied to human resources, identifying its particular from of specification, achievement, administration and non activation of the resource by the organization. Thus we are able to verify that the processes include vital aspects for its management.
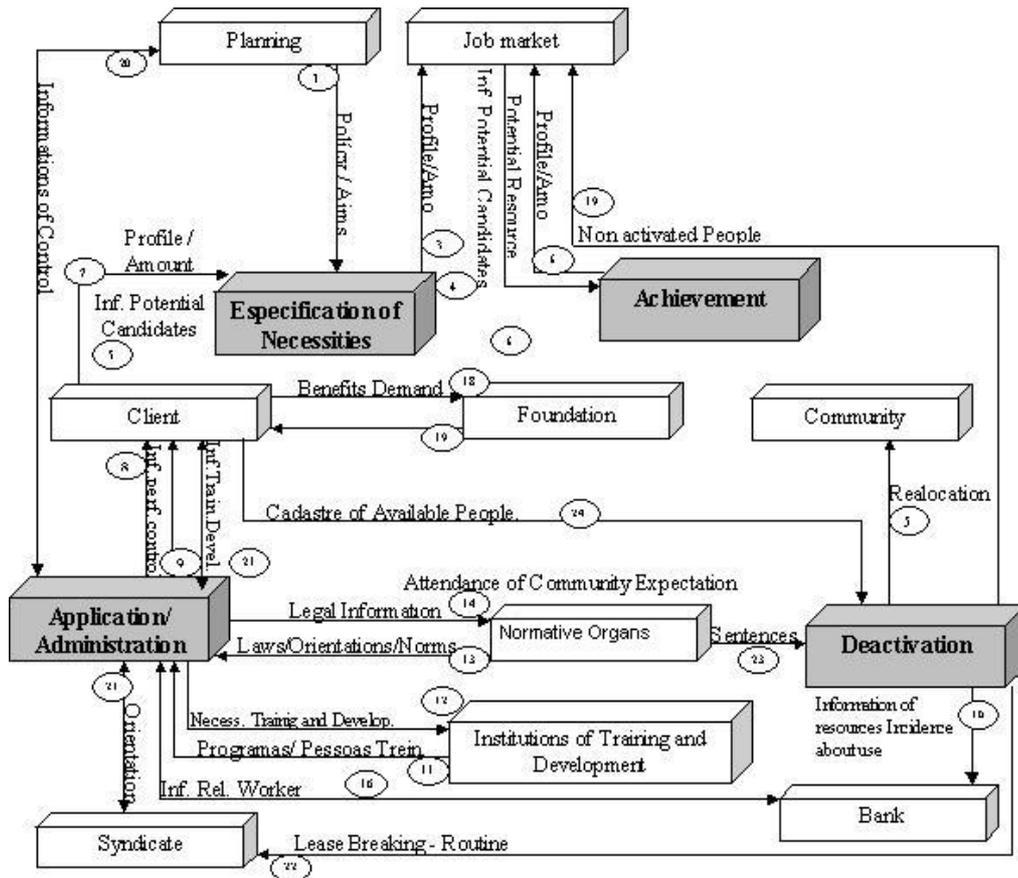
Diagram 1: Life cycle of Human Resources

After the establishment of the life cycle for each resource administered by the organization, it was possible to obtain a table, which presented the main information generated and used by the processes according to what is shown in Figure 3. These data classes were obtained by the analysis of the life cycle of resources, verifying the information that transited between one process and another and their integration with other processes and entities administrated by the enterprise.

Business Areas	1. Candidate's profile 2.Cadastre of employees 3.Personnel Control 4.Laborite Norms 5.Plan of personal Development 6.Register of Performance					
Processes	1	2	3	4	5	6
Specification of Personnel	G					
Effectuation of Personnel		G				
Administration of Personnel			G	G		
Attendance of Personal Necessities					G	G

Figure 3: Matrix of Data Classes generated by Processes

Based on Figure 3, all data classes generated and used by a process were extracted and a Data Flow Diagram was elaborated (Diagram 2) for each process, exploding in sub processes that identified the data flows between them and allowed to determine the ISs that would support the necessity of information management.
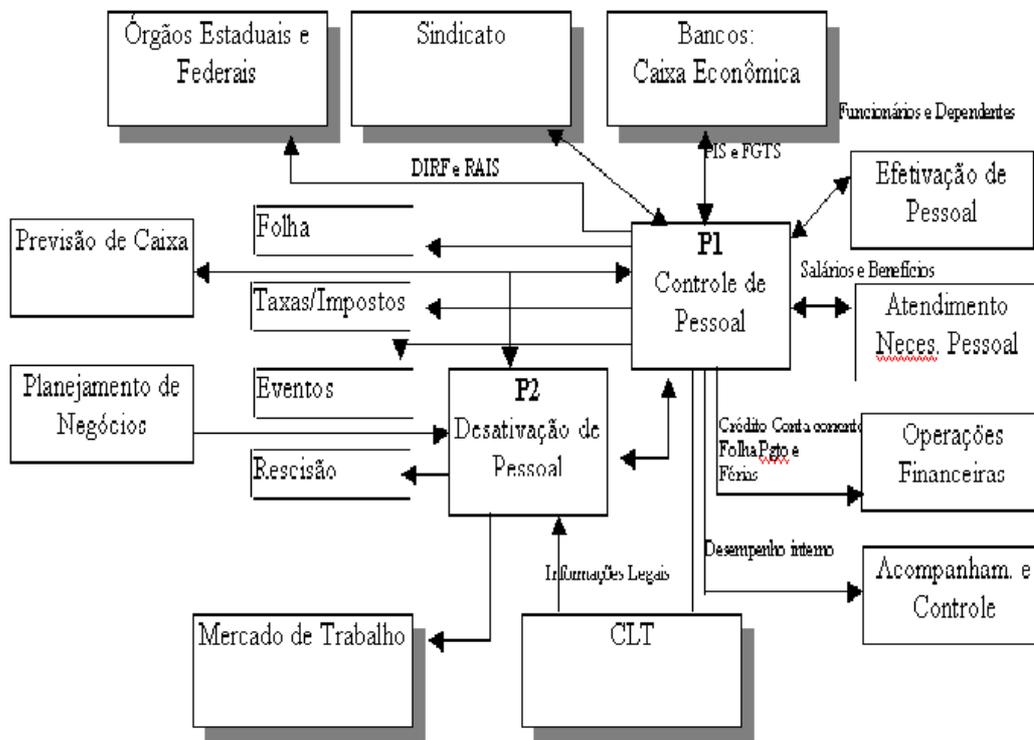
DIAGRAMA 2 – Diagrama de Fluxo de Dados do Processo de Administração de Pessoal

At last, an Action Plan was established through the setting of priorities, benefits and impacts previewed by the IS determined by the diagram study developed for each process identified in the life cycle of each resource administered by the organization.

6. Conclusion

A incorporation of an oriented approach for information processes follows the most recent tendencies of methodologies that search the integration of ISs. It is not what refers to the achievement of corporation systems, but especially in the sense of integrating business objectives with the information necessities that must be provided by the system. The establishment of the Information Architecture provides the business with a complete mapping of its processes structure, data and relationships between them. This leads to the comprehension of all information necessity of the organization. Besides, it creates an ambient of system development, which allows more consistence and sharing of data among other applications. Consequently, the systems developed are optimized in relation to costs, time for development and performance, due to the fact that they have a database that is already defined and adequate. (ALCOFORADO, 1997).

It was observed that during all the activity of mapping out of processes, some necessities of acquiring more knowledge about the business were identified, reviewing concepts and premises that could be reevaluated and turned suitable to the achievement of the final result of structure and learning of business. Another result was the

identification of activities that aggregated value to the enterprise's product and its critical points.

The established Action Plan used the issue of prioritization and impact, applying a model that is immune to particular interests and that are not according to the organization's strategic objectives. It was also intended to formalize most of the model's technical parameters. Those parameters must illustrate the business' IS structure, reflecting its view in relation to issues of information architecture and human resources in function of results, providing a strategy of IS for the enterprise.

References

ALSHAWI, S and THEMISTOCLEOUS, M and ALMADANI, R. (2004) - Integrating diverse ERP systems: a case study. Journal of Enterprise Information Management. vol. 17, no. 6, p. 454-462.

ALCOFORADO, M.M.D.G. (1997) - Sistema de Apoio à decisão para Priorização de Sistemas de Informação, Dissertação de Mestrado, Recife, DEES-UFE.

ALMEIDA, A.T. and ALCOFORADO, M.M.D.G. (1996) – Apoio a Decisão no Planejamento e Administração de Sistemas de Informação.

ALMEIDA, A.T. (1997) - Decision Modeling on Planing and Management of Information Systems. Joing Meeting EURO-XV/INFORMS-XXXIV; Barcelona, Spain.

ALMEIDA, A.T. (1998) - Um Modelo de Decisão para Priorização no Planejamento de Sistemas de Informação, Revista Produção, Vol. 8, n 2, dezembro/1998, pp. 1-22.

AMARAL, L. A. M. *Praxis* – um referencial para o planejamento de sistemas de informação. Disponível em: <http://shiva.di.uminho.pt/~jmv/htmls/algoritmi.html>. Acesso em: 06 dez. 2004.

BEYNON-DAVIES, P. and OWENS, I.; WILLIAMS, M.D. (2004) - Information systems evaluation and the information systems development process. Journal of Enterprise Information Management. vol. 17, no. 4, p. 276-282.

BOUTHILLIER, F. and SHEARER, K. (2004) - Assessing Competitive Intelligence Software: A Guide to Evaluating CI Technology. Performance Measurement and Metrics. Vol. 5, no. 1, p. 35-36.

CAULLIRAUX, H.M. (1995) – Integração de Sistemas de Produção – Information System Planning Guide, Application Manual GE20-0527, July.

FURLAN, J.D., HIGA, W., FELICIANO, A.N. (1988) - Engenharia da Informação: metodologia, técnicas e ferramentas. São Paulo: McGraw-Hill.

FURLAN, J. D. (1991) - Como elaborar e implementar o planejamento estratégico de sistemas de informação. São Paulo: Makron Books.

HOLT, A. P. (2000) - Management-oriented models of business process. In: AALST, V. D. W.; DESEL, J.; BERWEIS, A. Business process management: models, techniques, and empirical studies. Berlin: Springer-Verlag. (Lectures Notes in Computer Sciences, 1806).

IBM COPORATION,A.T. (1981) - Business System Planning – Information System Planning Guide, Application Manual GE20-0527, July.

JACKSON,I.F. (1986) - Corporate Information Management, Prentice Hall.

LAURINDO, F. J. B. and CARVALHO, M. M. and PESSÔA, M. S. P. (2002) - Selecionando uma aplicação de Tecnologia da Informação com enfoque na eficácia: um estudo de caso de um sistema para PCP. *Gest. Prod.*, vol.9, no.3, p.377-396. ISSN 0104-530X

MARTIN, J. (1991) - Engenharia da Informação, Campus.

POLL, S.W. (2004) – Prepared minds: Developing executives for success in the strategic planning process. Development and Learning in Organizations: An International Journal, vol.18, no.5, p.14- 16.

PORTER, M. E. (1989) – Vantagem Competitiva: Criando e Sustentando um Desempenho Superiro, Campus.

PUSCHMANN, T. and ALT, R. (2004) - Enterprise application integration systems and architecture - the case of the Robert Bosch Group. Journal of Enterprise Information Management. vol. 17, no. 2, p. 105 – 116.

REZENDE, D. A. (2003) - Metodologia para projeto de planejamento estratégico de informações alinhado ao planejamento estratégico: a experiência do Senac-PR. *Ci. Inf.*, vol.32, no.3, p.146-155. ISSN 0100-1965.

RIEG, D. L. and ARAÚJO F. T. (2002) - O uso das metodologias "Planejamento Estratégico Situacional" e "Mapeamento Cognitivo" em uma situação concreta: o caso da pró-reitoria de extensão da UFSCar. *Gest. Prod.*, vol.9, no.2, p.163-179. ISSN 0104-530X.

ROCKART, J. F. (1979) - Chief executives define their own data needs. Harvard Business Review, v. 57, n. 2, p. 81-92, mar./apr.

SANTOS, G.S. and CONTADOR, J.C. (2002) - Planejamento de Sistemas de Informação – Avaliação do Estudo de Sullivan. In: GESTÃO & PRODUÇÃO, v.9, n.3, p.261-275, dez. 2002.

STREHLO, K. (1996) - Date Warehousing: Avoid Planned Obsolescence. Datamation. 15 de janeiro, p.32-36.

WATSON, H. and WATSON R. and SINGH S. and HOMES, H. (1995) - Development practices for executive information systems. Decision Support Systems. v,14, n.2, Junho, p. 171-184.