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# A software tool for teaching and training how to build and use matrixes in strategic information systems planning

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**ABSTRACT**

Strategic information systems planning (SISP) allows an organisation to determine a portfolio of computer-based applications to help it achieve its business objectives. IBM´s business system planning for strategic alignment (BSP/SA) is an important technique for developing a strategic plan for an entire company´s information resource. BSP/SA has been described in terms of stages and the specific tasks within them. Tasks are usually done manually and require some experience. This work was thus aimed at presenting a computer-based application that automates two of the most important tasks in BSP/SA methodology: process-organisation matrix (POM) and processes-data classes-matrix (PDM). Special emphasis was placed on analysing, designing and implementing systems development life-cycle for developing the software. An important part of the analysis consisted of conducting a literature review and the semi-structured interviews with some experts in SISP. A special contribution of the present work is the design and implementation of statistical reports associated with each matrix. Automating this task has facilitated students being able to analyse POM and PDM during SISP workshops forming part of the Information Systems Management course (Systems Engineering, Universidad Nacional de Colombia). Results arising from the workshops have also been improved

**Keywords:** strategic information systems planning (SISP), processes, organisation, data classes, processes-organisation matrix (POM),processes-data classes-matrix (PDM).

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## Introduction

Identifying computer-based information systems (CBIS) that support processes and data (both input and output) is not an easy task for any organisation. It is a problem whose complexity increases, taking into account organisational units´ growth dynamics, processes and the data needed manage any organization.

Fortunately, CBIS level of support has been expanded and strengthened through developing computers and computer science. Electronic data processing (EDP) applied to accounting became data processing (DP) developed for all units and processes needed in any organisation. After the initial focus on data, there is now an emphasis on information with the concept of management information system (MIS). This new concept is aimed at providing further support from CBIS to the processes of an organisation, including all managers (Duhan, 2007; Teubner, 2007; Benita, 2003; Ward *et al*., 2002; Pant *et al*., 2001; Kearns and Lederer, 2000).

With the growth of CBIS potentialities there appeared the need to project them strategically (Chi *et al*., 2005; Newkirk *et al*., 2003). Among the hybrid methods related to the strategic information systems planning (SISP), BSP/SA stands out because it provides suitable management for support

analysis of an organisation´s processes and data classes (IBM, 1984). Such analysis is usually performed by hand and requires experience. This paper is presented to minimise human errors, save time in processing information, improve reporting and data analysis as well as providing flexibility to make further changes without much effort. The paper´s main objective is the announcement of a computational tool that automates matrix construction: processes vs organisation and processes vs data classes proposed in the BSP/SA. There are no similar software tools. A methodology was used that combines elements of software development to support management processes in organisations (Rondon *et al*., 2007, Avila *et al*., 2008), BSP/SA methodology (IBM, 1984) and elements of specific software development (Kendall and Kendall, 1997). A special contribution of this paper is the design and implementation of statistical reports related to each matrix. Although the developed tool has the limitations inherent in the Visual Basic development tool in Microsoft Office Excel environment, its importance also lies in the fact that its use has facilitated teaching SISP, particularly BSP/SA, and the results of SISP workshops have been improved regarding management & management information system (System Engineering, Universidad Nacional de Colombia).

This paper is especially meaningful for encouraging the development of software to support SISP tasks at the university. Aspects related to SISP are presented, emphasising BSP/SA methodology.

## Strategic information systems planning

SISP is the process by which an organisation determines the portfolio of computer applications for managing information in order to achieve business goals (Newkirk and Lederer, 2006; Mohdzain and Ward, 2007; Basu *et al*., 2002). There are several SISP methodlogies (Mohdzain and Ward, 2007; Ward *et al*., 2002; Kunnathur *et al*., 2001; Pant *et al*., 2001; King *et al*., 2000; Kearns *et al*., 2000; Teo and Ang, 1999; Lederer *et al*., 1996), including BSP/SA. This methodology develops the notion of alignment between strategic business planning and information systems planning. It is emphasised that implementing information systems should be a direct transformation of organisational strategy which takes into account the mission, objectives, goals, strategies and critical success factors (Kearns, 2006; Pant *et al*., 2001; Lee, 1999; Lederer *et al*., 1996). The objective of BSP/SA is to determine the information architecture that supports all organisation processes by producing a prioritised plan of information systems. It must take into account information needs associated with the development of all of a company´s identified functions. There are 13 stages within BSP/SA methodology: 2 regarding preparation at the beginning of the study and the remaining11 correspond to the study itself (see Figure 1).

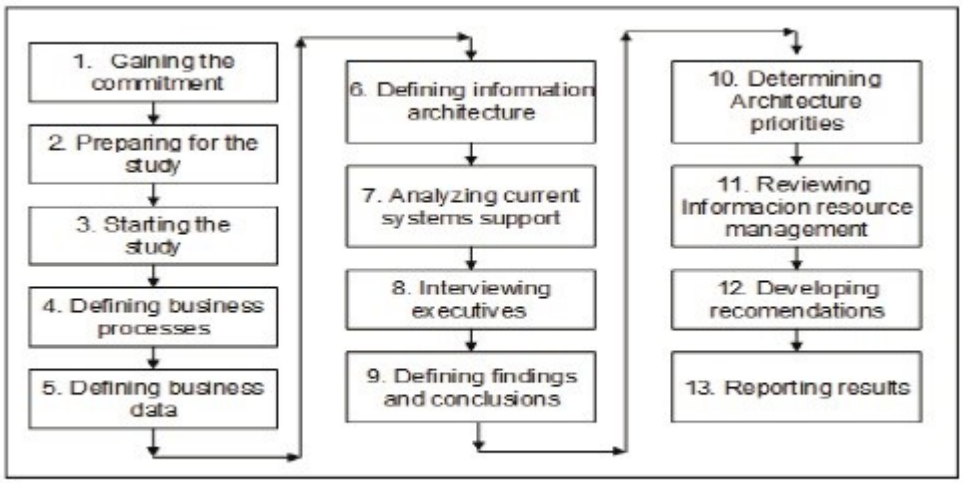
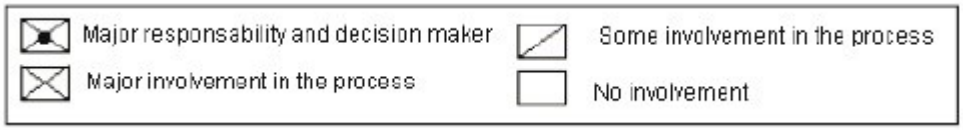



Figure 1. BSP/SA stages

There are two stages of particular interest when applying BSP/SA methodology that are wasteful when done by hand: stage 4 and stage 6. In stage 4, process determination, once the processes have been identified and described, they are then related to organisational structure. For each organisational unit (when several dependencies in an organisation can be clustered), the degree of participation in decision- making is determined; the following conventions are used for this:



Once the degree of participation has been established, the processes vs organisation matrix (POM) is then analysed (Figure 2).

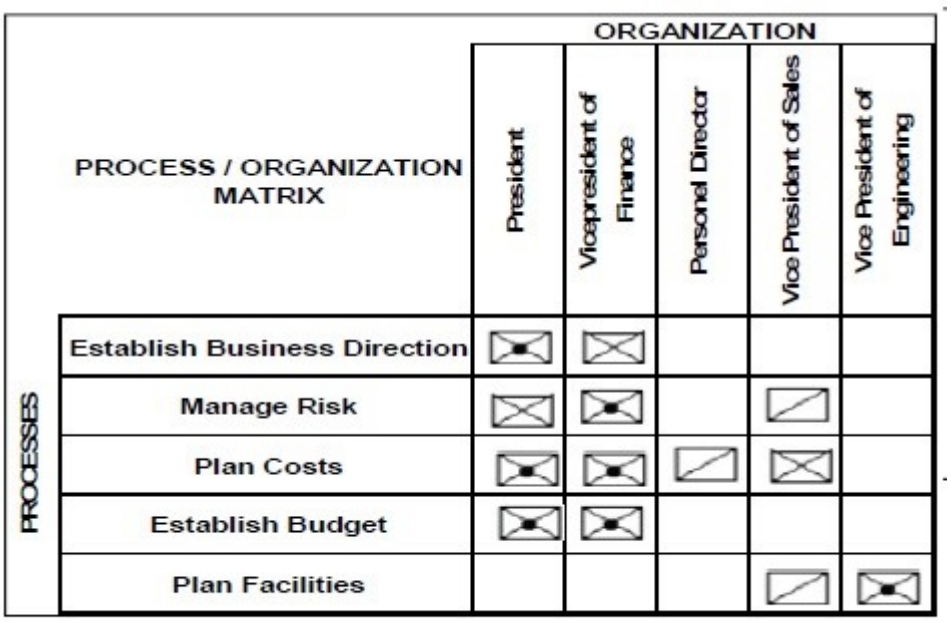



Figure 2. processes-organisation matrix (POM)

Certain abnormalities can be identified through this matrix related to processes such as repeated processes, overloading some dependencies and dependencies having low workload, processes with many directly responsible people or some processes without responsible people. The matrix leads to identifying which people must be interviewed within an organisation.

In stage 6 (determining information architecture), once data classes and the logical cluster of data related to entities that are important to the organisation have been identified and determined, the relationship between data classes and processes is established through the processes vs data classes matrix (PDM) (Figura 3).

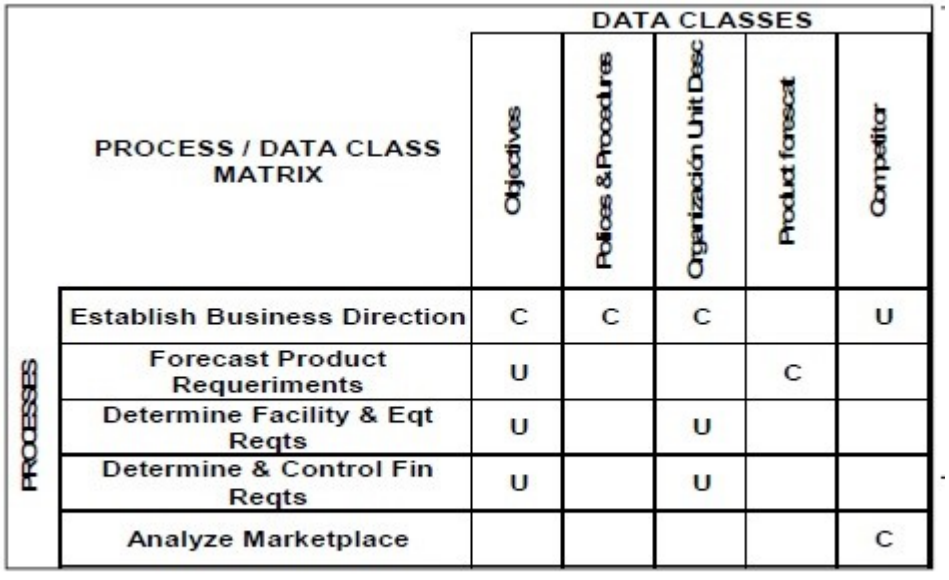



Figure 3. Processes-data classes–matrix (PDM)

Each data class´s relationship with the processes is determined using the following conventions: C, data class, created by the correspondding process; U, data class used by the corresponding process.

In principle, this matrix can be used for verifying that all data classes re-quired are present and that they have their origin in a single process. Now, taking the importance of POM and PDM matrices in BSP/SA methodology into account, integrating both matrices must be auto-mated since the analysis of informati

## Methodology

The methodology used for developing this work took into account software development characteristics for supporting management in organisations (Rondon *et al*., 2007, Avila *et al*., 2008), BSP/SA stages(IBM, 1984) and specific software development (Kendall and Kendall, 1997). The stages included reviewing and analysing SISP and BSP/SA literature, semi-structured interviews with experts in the field to assess the statistical reports, testing the so-designed reports with certain matrices (Romero and Romero, 2003) and developing a computational tool, taking into account the system analysis and design approach using systems development life cycle (SDLC) emphasising analysis, design, implementation and use stages. The results obtained by automation were compared to those calculated in stage c to verify the correct running of the tool. The computational tool was developed in Visual Basic in Microsoft Office Excel environment to provide ease of use and take advantage of all editing abilities and the environment offered by this spreadsheet in conjunction with Visual Basic language.

## Results

The tool allows a user to perform the following tasks:

- Enter the names and descriptions of processes taking place in an organisation;

- Enter the names and description of an organisation´s groups of processes;

- Classify processes into the respective group process based on information entered by the user;

- Enter the names and description of a company´s organisational units;

- Automatically create the POM based on process and organisational unit information entered by the user;

- Edit the POM´s ruled columns establishing the degree of responsebility for each organisational unit in a process;

- Automatically generate reports defined by the POM;

- Enter the name and description of data classes identified and defined in the company;

- Arrange the processes in order to put strategic planning and management control first, then products and services in the life-cycle sequence and lastly processes for support resource management;

- Determine the process that creates each data classes based on information provided;

- Determine data classes used by each process based on information supplied;

- Automatically create the PDM based on information regarding pro-cesses, data classes and the creation and use of data classes ente-red by a user;

- Automatically generate reports defined by the PDM; and

- Define automated reports from the tool.

POM reports: processes having no directly responsible people in the organisational structure; company dependencies having no directly responsible people, at least, for a process; processes directed by more than one dependency (Figure 4).

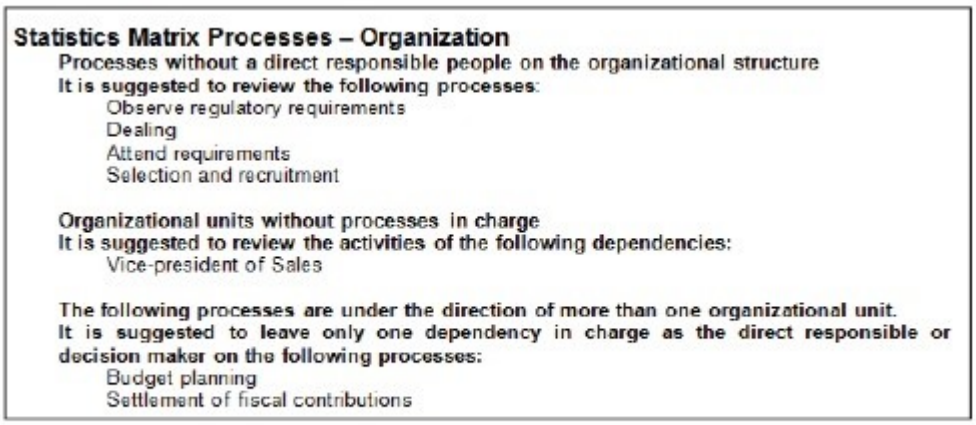



Figure 4. POM reports

Prior reports allow a user to identify any abnormalities that should be analysed before proceeding with the methodology. Statistical analysis of the POM can then be carried on. The complementary statistical analysis reports of the POM can be viewed in Figure 5.

| | Process in charge with responsibility | | | |
|---|---|---|---|---|
| Organization | High | Medium | Low | Total |
| President | 6 | 2 | 6 | 14 |
| Vicepresident of Finance | 2 | 4 | 6 | 12 |
| Personnel Director | 6 | 1 | 5 | 12 |
| Vicepresident of Sales | 3 | 5 | 1 | 9 |
| Vicepresident of Engineering | 5 | 0 | 2 | 7 |

| | Dependencies with responsibility | | | |
|---|---|---|---|---|
| Process | High | Medium | Low | Total |
| Develop Business Plan | 1 | 0 | 3 | 4 |
| Manage Risk | 1 | 0 | 3 | 4 |
| Plan Costs | 1 | 1 | 2 | 4 |
| Establish Budget | 0 | 1 | 2 | 3 |
| Plan Facilities | 1 | 0 | 2 | 3 |

Figure 5. POM statistical reports

Statistical reports allow thorough analysis of the situation in an organisation regarding the relationship between its processes and dependencies, taking the level of responsibility (high, medium and low) into account.

*Organisational performance reports:* percentage participation of each company dependency in processes (Figure 6). Percentage participation of every dependency in the whole system (Figure 7).

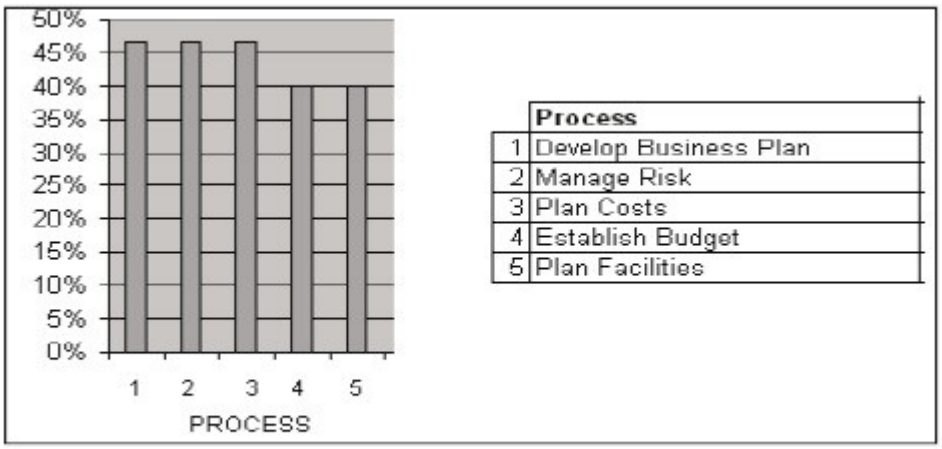



Figure 6. Percentage organisational participation in processes

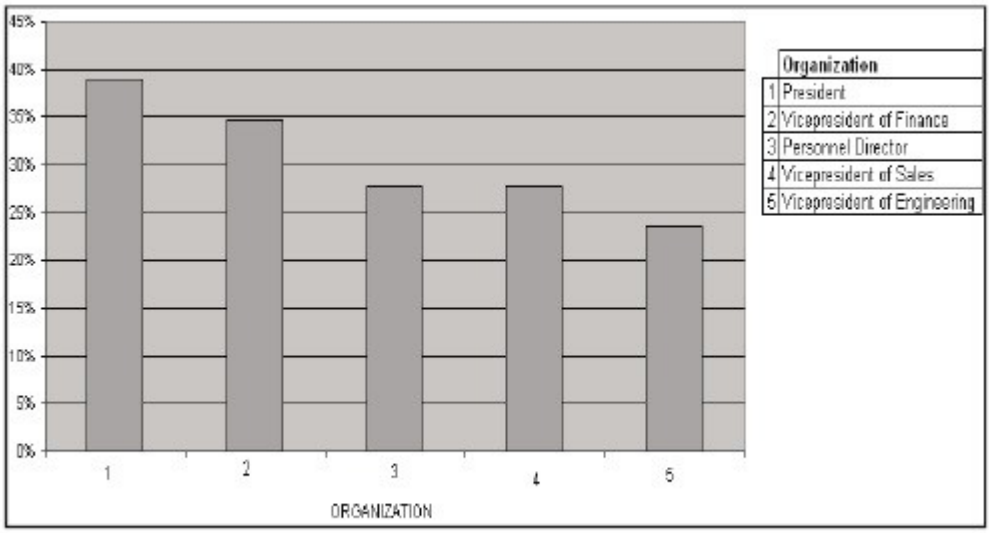



Figure 7: Percentage participation of every organisational unit in the system

PDM reports: processes that do not use data classes, processes that do not create data classes, processes that do not create or use data classes, data classes that are not used in any process, data classes created by more than one process (Figure 8).

Prior reports allow a user to identify any abnormalities that should be analysed before proceeding with the methodology. PDM components can then be statistically analysed. Complementary PDM statistical analysis reports can be viewed in Figure 9

| | | Data Classes | | |
|---|---|---|---|---|
| | Processes | Used | Created | Total |
| 1 | Develop Business Plan | 7 | 7 | 14 |
| 2 | Manage Risk | 4 | 7 | 11 |
| 3 | Plan Costs | 4 | 5 | 9 |
| 4 | Establish Budget | 3 | 4 | 7 |
| 5 | Plan Facilities | 3 | 4 | 7 |

| | Processes | | |
|---|---|---|---|
| Data Classes | Used | Created | Total |
| Objectives | 3 | 4 | 7 |
| Polices & Procedures | 3 | 4 | 7 |
| Organización Unit Desc | 3 | 4 | 7 |
| Product forescat | 2 | 3 | 5 |
| Competitor | 2 | 3 | 5 |

Figure 9. PDM statistical reports

Statistical reports allow thorough analysis of the situation in an organisation regarding the relationship between processes and data classes, taking into account the property for using or creating data classes.

The tool and the user´s manual can be loaded from the website: http://www.docentes.unal.edu.co/facortesa/docs/966/

## Conclusions

Manual processes supporting critical steps in SISP implementation can be automated through methodologies and software development technologies.

Software products supporting SISP teaching and training can be created by means of interaction between systems engineers´ skills and expertise and administrative knowledge.

BSP/SA methodology is known for proposing a proper analysis of process level of support for organisational units and data classes but does not take advantage of the qualitative and quantitative analysis associated with the matrices used.

It was very useful to apply basic statistical concepts analysing the matrix and conducting semistructured interviews with experts in the field.

Qualitative and quantitative reports, which can be applied to matrices proposed in BSP/SA, are based on identifying the empty rows and columns of each associated data structure

Software, as presented in this paper, has the following advantages: facilitating teaching and training in constructing POM and PDM,supporting the construction of POM and PDM and providing reports to accompany POM and the PDM analysis. The tool has the limitations inherent in the development tool (Visual Basic in Microsoft Office Excel environment).

POM and PDM are useful tools within SISP and their results are meant to be completed with results from other matrices, typical of BSP/SA methodology, such as process-clustered data classes matrix. The added value of the tool presented in this paper is the possibility of having a user-friendly software that can be used for teaching and training in constructing POM and PDM matrices in educational establishments and small and medium sized companies, without incurring higher costs. It is worth stating that it was of vital importance to follow a good methodology for analysis and design in developing the software before its implementation. The analysis stage and the design stages were the most difficult because the participation of several experts in the field was needed and the complexity of the project. Difficulties arising du-ring the implementation stage were due to technical problems which were solved thanks to the programming tool´s good documentation and the work team´s quality regarding computer programming training; the team´s concern and motivation were fundamental in concluding the present work.

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