TISM
A Tool for Information Systems Management

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Abstract: The complexity of Information Technology and Information Systems within organizations keeps growing rapidly. As a result, the work of the Chief Information Officer is becoming increasingly difficult, since he has to manage multiple technologies and perform several activities of different nature. In this position paper, we prove the development of a new tool for Chief Information Officers, which will systematize and aggregate the enterprise Information Systems Function information.

1 INTRODUCTION

The complexity of the Information Technology and Information Systems (IT/IS) within organizations keeps growing rapidly.

In order to manage that complexity, there are several tools commercially available for Chief Information Officers (CIOs). These tools vary considerably in their capabilities and are almost always focused on one specific management item. Consequently, it is difficult for the CIO to get the overall picture of the Information Systems Function (ISF) of the organization, which may affect the CIO job.

We hence advocate that it is needed a new holistic and integrated tool to support the Chief Information Officers (CIOs) activities. In this position paper we propose the development of TISM - a Tool for Information Systems Management -, in particular, the conceptual model that supports it.

In this paper after this brief introduction we present the background section where we describe the main ISF activities and tools to support them. Then we present the conceptual model for the future tool to develop discussing its merits and challenges. Finally we present the research agenda for the development of the new tool.

2 BACKGROUND

In order to ensure the proper operation of IT/IS, organizations require an Information Systems Function (ISF) that is well structured and skilful in order to provide IT services needed to support the organization business.

Information Systems Function is composed by the set of organizational activities aiming to optimize the organization's IS, and can be analysed under three main complementary views, which provide a complete perspective (Varajão, 1997, Varajão, 2002): activities (planning, development, exploitation, and management), resources (human, financial, technological, and informational), and influencing factors (structural, environmental, social, cultural, psychological, and time-related).

It is useful to conceptualize the ISF by the means of four main groups of activities (Varajão, 2002): Information Systems Planning (ISP), Information Systems Development (ISD), Information Systems Exploitation (ISE), and Information Systems Management (ISM).

ISP is responsible for identifying the systems that are needed in an organization, thus preceding ISD, in charge of developing the systems identified during ISP. Afterwards, ISE is responsible for ensuring the proper usage of the IS, in the best interests of the organization. The ISM is required to provide structure and control to all these activities.

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ISP is a necessary precursor to ISD, since it provides a long-term vision, by identifying the potential systems and defining a full set of management policies and approaches. It is assumed that ISP is integrated and aligned with the business planning, being therefore a planning strength for organizational change, provided by ISD, since a new system frequently implies a new form of organization.

In order to support the needs of the organization as time elapses, IS must adapt to the naturally occurring changes. In this sense, it is possible to consider a cyclical and continuous sequence of ISF activities: the several activities feed each other in each system generation, and possess strong interlinks.

It is possible to consider a logical sequence of activities, under which an IS is thought-over (in the scope of ISP), produced (in the scope of ISD), and then used (in the scope of ISE). However, in practice these activities take place concurrently, with significant inter-relationships and interdependences; and these relationships are strongly interactive. The several activities cannot be approached in isolation; they must be taken in account and integrated together.

There are multiple propositions for ISP, ISD, ISE, and ISM, each involving several activities (Kendall and Kendall, 1992) and denominations (Martin et al., 1994). It is somewhat hard to come across two authors agreeing in detail over the same proposition (Sager, 1990). However, in spite of all variations, their nature is mostly similar. Table 1 presents those activities that met major dissemination and are most commonly accepted for the ISF.

Table 1: ISF activities. Source: (Varajão, 2002).

Groups of activities	Activities
ISP	IS Strategy analysis
	IS Strategy definition
	IS Strategy implementation
ISD	System analysis
	System design
	System development
	System deployment
	System maintenance
ISE	System operation
	IT management
	Human resources management
	Procurement of services and resources
	Other, diversified activities
ISM	Organization and control

To support the ISF activities there are several tools, as identified in a previous study (Trigo et al., 2008a): Sarbannes-Oxley Act (SOX), Basel II, Health Insurance Portability and Accountability Act (HIPAA), IT Balanced Scorecard, Return On Investment (ROI), Total Cost of Ownership (TCO), Earned Value Analysis (EVA), Enterprise Risk Management - Integrated Framework (COSO), Control Objectives for Information and related Technology (CobiT), Project Management Body of Knowledge (PMBoK), PRojects IN Controlled Environments (PRINCE2), Capability Maturity Model® Integration (CMMI), Software Process Improvement and Capability dEtermination (Spice), Six Sigma, ISO 9000, TickIT, ISO 27000, Information Technology Infrastructure Library (ITIL) with several software tools from IT vendors sucha as System Center from Microsoft, HP Openview from HP, Tivoli platform from IBM, etc., ISO 20000, enhanced Telecom Operations Map (eTOM) and Business Process Management (BPM).

Beyond the CobiT framework, which must be implemented on some software architecture, none of the above tools covers all the ISF activities.

This is a problem because CIOs need a tool that supports the management of the ISF activities in an integrated way and not the sole management of each one of them.

3 TISM

TISM stands for Tool for Information System Management, and enables the management of ISF based on the architectural vision of the ISF.

There are numerous propositions for the definition of the IS architecture of an enterprise, being one of the most widely used, the framework proposed by Zachman (Zachman, 1987), which is easy to understand and addresses the enterprise as a whole being independently of tools or methodologies, and any issues can be mapped against it to understand where they fit (Lankhorst, 2005).

Our tool and respective conceptual model is not an implementation of this framework, but it does inherit the idea of the use of matrices to map the different IT/IS elements, some of properties derived from Zachman framework dimensions and the use of perspectives looking at the organization IS architecture and ISF.

Based on the this architectural vision of ISF, we reached the conclusion that one best way to implement a tool for ISF management would be

through the use of matrices that would link the various elements of the ISF, be they management objects, activities or resources (and other elements that maybe necessary), as shown in Figure 1.

The importance of using matrices is reinforced by a previous study conducted with the purpose of identifying and characterizing which software tools CIOs of large Portuguese companies use in their work, that revealed CIO's preferred software tool to support their activities is the spreadsheet (Trigo et al., 2008b).

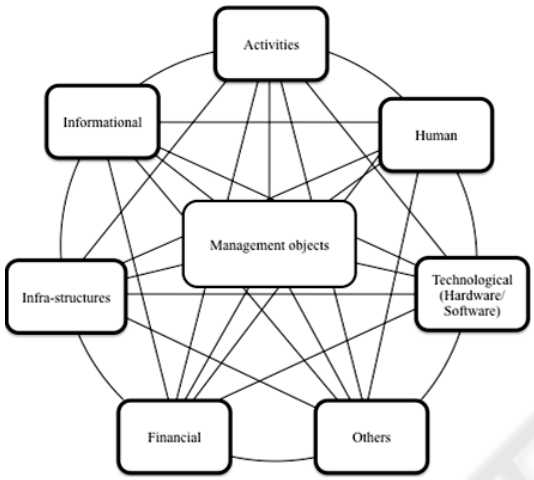

Figure 1: Conceptual model of TISM.

In TISM matrices are used to map different types of elements. Only two types of elements, and their relationships compose each individual matrix.

One example, of this kind of construction would be the matrix Activities/People, where we would map how human resources are involved in the different activities, such as, being responsible (R), having a strong (S) or some participation (SP), in the development of one activity, which would consist in the relationships between activities and people. This would allow the CIO to have a complete picture of how the human resources are allocated. A brief example is provided in Table 2.

Table 2: Activities/People.

Activities / People	Joe	John	Johan	…
IS Strategy analysis	R	S		
System maintenance		SP	S	
System operation		SP	S	
IT management		S	S	

The use of a software tool based on this model would be straightforward, given that the user would do five steps for the matrix definition: define the element types, with respective characteristics; create the elements and assign the values for the characteristics defined; create the matrix, selecting which elements of a given type to include; define the relationships for the two types of elements of this matrix; and assign relationship values to the elements of the matrix. This process would be done only once, at matrix creation.

It is important to enhance that elements are reusable and can belong to as many matrices as the user wishes, so for some matrices, he/she just needs to select elements and create relationships.

The use of matrices with only two types of elements allows to see how one element relates with all the other elements of the ISF, giving not only a holistic perspective of that element, but also making it easier to identify where errors/redundancies of its use. We can, for instance, detect trough the use of this model if a certain resource is well allocated.

Since the application will be used to map all the elements, or at least the most important ones, for the ISF management, we anticipate an important drawback, given the dimension of the organization and ISF where it will be used that may produce matrices of very large dimension, which is the manipulation of the matrices created, something that would also happen with a spreadsheet.

In order to facilitate the manipulation of the matrices, in the application to develop, we suggest the creation of a "split" functionality that would keep the elements (headers of the columns and rows) fixed and visible, while navigating through the matrix to manipulate a certain relationship. In order to facilitate the element creation we consider that is also necessary to create a mechanism to important all elements of a given type from a file, a task that should be done by another member of the IT team rather than by the CIO, to who the application is intended.

While the process of defining the different types of elements, elements, matrices and relationships is done by the user of the application, in most cases the CIO, we considerer that the application should possess routines (e.g. web services) to allow it to interact with other systems in order to collect the management information needed, similar to what some ITIL suits already do (Baldwin, 2008, IBM, 2006, Hewlett-Packard, 2007), by indicating the usage of hard disk drives by servers or by knowing how much licences are in use of a certain software application. This would avoid the CIO need to recur

to a third party application to get information needed.

Beyond this integration, which would allow maintaining the management information updated, there is another situation, which could be addressed in the development of the application, that is the self-management of some systems based on the management information provided by them through the use of software agents, using decision making algorithms that are tuned to evaluate different decision making strategy and implementing different decisions in real-time (Banker and Kauffman, 2004, Shirazi and Soroor, 2007), which would free the CIO from some more trivial management decisions.

Although the conceptual model does, in our opinion, covers all the management issues of the CIO activity, there is an important drawback, which is the knowledge that the CIO has of the ISF and of the IT/IS solutions in use within the organization, since the conceptual model does not indicate which elements, matrices or relationships to create to support the management of ISF.

To shorten the CIO learning curve towards the use of an application based in this conceptual model, one should include a set of examples, which include element types, elements, matrices and relationships so that the CIO can see what he/she can and cannot do with the application.

4 AGENDA

Our research agenda will have to focus on two items: on the development of the tool based on this conceptual model and on the creation and characterization of element types, elements, relationships and matrices that will be part of the tool.

We are now developing the TISM prototype based on this conceptual model, with PHP, MySQL, and also AJAX libraries, such as jQuery, which allow producing richer interfaces, making it easier for the user (CIO) to use it. One of our objectives is, due to the complexity of the issue, to produce an easy to use and learn interface. Otherwise CIO will not spend time to learn how to use it.

Figure 2 shows a screenshot of a real matrix Activities/People of the IT team of a Portuguese university, which, as we can see, is of a considerable dimension. Other matrices such as hardware/installations, enterprise software/ hardware, etc., are being implemented and tested, for their usefulness and validity. But the work is still in progress.

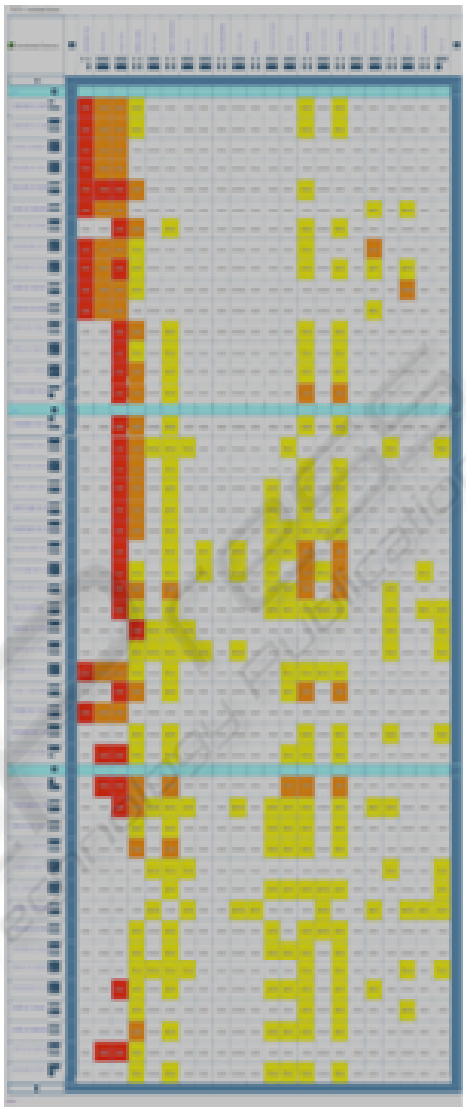

Figure 2: TISM prototype screenshot.

Another challenge is to create the initial set of element types, elements, relationships and matrices, a task that is independent from the development of the tool itself, and from the tool, since the conceptual model presented here can be implemented with other technologies beyond the ones we are using.

5 CONCLUSIONS

Commonly found activities in the ISF are thus, e.g., project management, application development and maintenance, IT management, help desk, network management, and many others.

For management and development of these activities, CIO have at their disposal a wide variety of approaches and tools, which usually are not supported in an integrated manner by one single software tool. Such a tool is needed to allow the management of all ISF related activities and resources.

In this paper we described a conceptual model to support the development of an application that will support the management of the ISF in a holistic and integrated way, which can contribute for the CIO overall success.

The next stage in our research will be to implement this new conceptual model into a fully functional prototype, which we have already started, and test for its usefulness.

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