Chief Information Officer's activities and skills in Portuguese large companies

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Abstract
The activities and skills of the information systems manager evolved extraordinarily in the last half century, from the technician who managed an operational function with a limited importance to the organization, to the position chief information officer, now responsible for a department on which depends the overall success of the organization. This study provides some empirical insight on the chief information officer profession in Portugal. We conducted a survey directed to the chief information officers of Portuguese largest organizations to investigate how they spend their time and to evaluate which are the most important skills for the role they play on the organization. We also compare the results obtained with other studies to try to unveil which differences exist in the activities performed by Portuguese chief information officers and chief information officers from other countries. This study can also be viewed as a guideline for the development and training of existing chief information officers as well as for hiring new managers for this position with the right skills, to assure the right management of information systems.

Keywords: CIO; CIO activities; CIO skills; IS management.

1. Introduction

Information, data resources and Information Systems (IS) are critical resources for the organization and few are the companies that today attempt to conduct their business without seeking to exploit Information Technologies (IT) to achieve competitive advantage. To fulfill the increasing information needs of companies IS departments have grown and assumed new structures, responsibilities and roles. The job of the chief information officer (CIO), typically the head of the IS function in a company, likewise has also seen some major changes. Having the right CIO with the right skills is of great importance, since they are in many companies the key driver of business innovation [1], being responsible not only for the IS department future but also for the company future.

Based on previous studies made in US [2-4], Canada [5, 6] and Europe [7] devoted to examine the nature of the CIO work, we created a survey to evaluate which are the most time consuming activities for the Portuguese CIOs and which skills they consider as the most important for their job.

Although we can find several international studies about the CIO, there is not too much information about specific country realities like Portugal. So, it is important to find out if some of the main aspects of the CIO profession differ considerably between countries. This study was carried out to enrich the knowledge about the CIO role in Portugal and to assess its current state in comparison to their international counterparts.

2. Literature review

The CIO is responsible for the IS function of the company, a formal company unit or function usually called IS department. Most of our existing knowledge about CIOs comes from practitioner sources, such as Gartner [8, 9] and Forrester Group [10], or from articles and surveys performed by magazines such as CIO Magazine [4].

2.1. Chief Information Officer

The CIO position emerged in the early 1980s as a result of increased importance placed on IS. Since its inception, the CIO position has gradually become more important in nature as IT has been increasingly playing a more central role in the firm's daily operations, business processes, and overall business strategy.

The most significant change in the role of the CIOs is their paradigm shift from technology to business. The CIO's position in the corporate structure is rising steadily and inexorably from the tactical/operational level to the strategic/management level [11]. To demonstrate the increasing role of the CIO position, Chatterjee and Richardson [12] showed that market announcement of new CIO positions created positive reactions in the marketplace. In addition, CIOs have become ideal candidates for CEO positions, especially for technology firms [13, 14].

Today's CIOs have assumed many influential roles and responsibilities, such as overseeing new product development, facilitating knowledge management activities, prescribing business process reengineering efforts, assuming regulatory compliance, and administrating the company's IT maintenance. The CIOs of today are reported to see themselves as business executives with responsibilities for harnessing the potential of IT in the interest of their company business.

In taking this position, the CIOs have found the need to address key management factors such as maintaining a holistic business perspective when managing IT, being knowledgeable in relevant non-IT disciplines, managing people effectively, building relationships within and without the company and facilitating communication at all levels.

To sum up, the CIO position has become extremely important, not only for the IS function, but also for the success of the entire company and its overall strategy.

It is also important to notice that the CIO role differs from the Management Information System (MIS) manager [7]. The CIO operates as an executive rather than a functional manager, and often reports to the CEO. According to CIO magazine "State of the CIO" study [15], 42% of the CIOs are in this position.

2.2. Chief Information Officer Activities

Issues in information systems management are important determinants of the CIO role, representing guidance for her/his work. As a result, the role varies greatly, for example, in terms of the organizational structure, the IS human resources or IS budget. In this study, we come along with a group of activities based on previous studies, which she/he has to or should perform in the day-to-day job.

Interacting with the Top Management Team (TMT) is a crucial activity since both the CIO and TMT have as one of the top concerns the IS strategic alignment. CIOs and TMT need to have a shared language and a shared understanding regarding the role of IS and IS function within a company. The lack of language and understanding is one of the most cited reasons for the poor IS strategic alignment [16]. The CIO needs to know what the TMT and stakeholders expect from the CIO role and to ascertain the TMT of the importance of certain initiatives [17, 18], which may lead the business into new levels.

Making strategic decisions involve formulating IS objectives, defining strategies, policies and detailed plans to achieve them [19, 20].

Managing projects and application development faces new challenges since most of today's projects and applications are not built in-house. They tend to be partially or totally outsourced to countries with inferior cost [21, 22]. Beyond being an organizational form for time-limited task execution the project is also an organizational form for triggering knowledge development and learning [23], so, project management is an activity that needs the CIO attention in order to contribute to the overall knowledge of the organization.

Another CIO activity is the designing and optimizing of business processes through IT. This is the activity where the CIO can prove the value of IT by defining and adjusting IT standards and technologies to the business processes as, for example, developing an integrated decision support process for supplier selection in construction companies where the value of purchased materials and components accounts for 50-80% of total cost of goods sold [24].

Hiring, developing and managing the IT staff are the CIO responsibility [11]. The CIO needs to guarantee the current and future shortage of qualified IS personnel that threatens the IS department ability to keep up with the information needs of the company [25].

Outsourcing of IT started in the 90s and did not stop growing. Many companies even see it as the holy grail for all the problems within an organization and the way to achieve all the organization goals [26]. Therefore, the ability to interact with IT vendors, outsourcers and service providers is in growing demand [17]. The CIO is now entering into a new era where the IS function internally is shrinking rather than growing [27] and where the outsourcing of IT activities becomes a vital component of the IT plan, and the CIO to a certain degree must become more of a risk management expert.

Managing crisis is an activity, which most CIOs should not need to perform if everything went well and there were not any surprises in the way. The truth is that a large number of CIOs, mainly in small medium companies end up performing this activity more than they would like [28].

Budgeting is the process of predicting and controlling the spending of money. It consists of a periodic negotiation cycle to set budgets and a day-to-day monitoring of the current budgets [29]. The CIO must ensure that investment decisions are aligned with the strategic goals of the IS department, are well planned and justified, fit within the IS department's overall IT/IS strategy and IS architecture, and are managed effectively throughout the life cycle. The CIO must also assess the cost, risk, and return for all proposed expenditures on IT [30].

Interacting with clients and business partners effectively is very important due to the fact that many of the IT projects are developed for external client use and not only in-house use.

In the table below, we present the activities we found more common in CIO work.

Table 1 - CIO activities

| Interacting with top management team [16-18, 31] |
| Making strategic decisions [19, 20, 31] |
| Managing application development [21, 22, 31] |
| Managing projects [23, 31] |
| Optimizing business processes [31] |
| Hiring, developing and managing the IT staff [11, 31] |
| Interacting with IT vendors and service providers [31] |
| Managing crises (putting out fires) [28, 31] |
| Budgeting [29-31] |
| Interacting with clients[31] |

2.3. Chief Information Officer Skills

Our research also focused on the skills a CIO must possess to perform her/his job successfully, which we present in the following paragraphs.

The ability to communicate effectively is critical in working with business counterparts to learn and understand different business needs [32]. If CIOs cannot communicate well, their projects will die either at the approval stage when the executive committee rejects them or at the implementation stage when users resist them. If CIOs do not get better at projecting themselves into the centre of the corporate decision-making process [33], their job will not steer the company toward its next competition-crushing opportunity, and will probably be taking orders and putting out fires.

Strategic thinking and planning skills are critical [34], because without them the CIO cannot help her/his company respond to changes in the marketplace. In addition, good strategic planning and thinking skills can help the CIO have influence beyond the IT department. As one of the few people who work with every business unit, the CIO is in a position to see more possibilities on how technology can help the company to be more competitive.

Ability to lead and motivate staff is essential to get the job done [35]. If a CIO can't lead and motivate her/his team to apply skills and techniques to solve dynamic problems and to get projects done in the approved deadlines, the CIO will be in serious problems.

Understanding of the business processes and operations is critical in order to prioritize projects so the TMT won't resent the CIO for wasting resources on the wrong projects [36].

The ability to follow technological innovations: the global CIO should direct research and evaluation of emerging and advanced technologies of interest, examining the potential of these technologies to address a business requirement or to create a new business opportunity [37]. Although the CIOs do not need to have in-depth knowledge of cutting-edge technology, they must be a "quick study" person, able to learn enough from the expert on staff who is watching the horizon to report intelligently on these technologies to the TMT, business-unit leaders, and other constituencies [19].

Negotiation skills are crucial for CIO [38], to be able to make trade-offs without compromising relationships. Sometimes TMT expectations are to high and the CIO, after carefully analyzing, must explain what is and what is not possible to do with IT/IS [5].

Technical proficiency, often relegated to a second plan since the TMT already expects the CIO to possess this skill. Whilst CIOs are playing an increasingly business-focused role, the responsibility for running effective technology operations remains. The challenge is maintaining an appropriate level of technical competence without jeopardizing the focus on business [11].

In the table below, we present the skills we found important in our research.

Table 2 - CIO skills

Ability to communicate effectively [31-33]
Strategic thinking and planning [31, 34]
Ability to lead and motivate staff [31, 35]
Understand business processes and operations [31, 36]
Ability to follow technological innovations [19, 31, 37]
Negotiation skills [5, 31, 38]
Technical proficiency [11, 31]

3. Research focus, design and method

A survey was conducted to study CIO's most time consuming activities and most important skills in Portuguese largest companies, due to their importance to information systems success.

The general methodology involved a questionnaire that was sent to 500 Chief Information Officers (CIOs) of Portuguese largest companies by gross revenue. CIOs are responsible for managing the IT department. Therefore, they should have rich information about all the aspects concerning their own activity.

The questionnaire was sent to the subjects in 2006 July. Three months later, after two rounds, 54 usable questionnaires were received and the data collection process was concluded.

3.1. Subjects

The survey, undertaken from July to October 2006, focused on Portugal's largest companies. The subjects in this study consisted of CIOs of the 500 largest Portuguese companies by gross revenue listed in the 2003 issue of Exame Magazine [39]. This particular audience was preferred because large organizations are generally leaders in technology use and application [40, 41], and need to have a well structured IT department to deal and manage the overall information system architecture. Therefore, the use of the Exame 500 companies as the target group seemed most appropriate.

3.2. Questionnaire

A survey instrument was formulated (see Appendix A for selected portions) to obtain feedback from the largest Portuguese, assessing their IT/IS reality.

The structure of the questionnaire, partly based on earlier surveys conducted by CIO magazine [4], addressed several key aspects of IT departments with Likert scale, nominal scale, ordinal scale, interval scale and open-ended questions. The questionnaire was divided into several sections, each one with well defined objectives.

The proposed questionnaire was pre-tested several times to validate its content and readability and to improve some aspects of the questions. The

necessary changes were made to the final questionnaire, which was delivered to all Exame 500 CIOs by post. With the questionnaire was sent a letter briefing the subjects about the scope and goals of the study, including a link to an Internet home page, which allowed filling the questionnaire online. CIOs were asked to answer by returning the questionnaire in paper form support by post or to answer online.

3.3. Data representativeness
The survey was mailed to 500 CIOs of Exame 500 companies. The number of undelivered and return questionnaires was 11 so, that 489 total questionnaires were mailed. This mailing received 55 responses. Of these, one was rejected because many items were left blank, yielding a final usable response rate of 11%.

This response rate did not come as a surprise as it is comparable with the response rates of others studies conducted in the last few years [40-45]. This may be due to the fact that the subjects are unwilling to respond to unsolicited survey [41], or simply had insufficient time [44] or because many more companies set a policy of rejecting survey questionnaires [41, 44].

It is interesting to note that, although a paper version of the questionnaire was sent by post, unlike others studies in the past [42] the overwhelming majority of CIOs (82%) replied electronically online.

Before the data analysis, the data representativeness of the sample was examined. As others studies [40, 41], non-response bias was examined by comparing industry type of the respondents to entire sample. The Chi-square goodness-of-fit (Chi-square=14.39, p<0.085) test showed that industry type of respondents was not significantly different from the Exame 500 companies as a whole.

The majority of CIOs that answer the survey were male (94%) with a Bachelor's degree (65%). They have an average tenure with in their organization of 10.6 years and an average tenure in their current position of 7.6 years.

4. Analysis and results
In this study we seek to characterize how the CIO spends her/his time and which are the most important skills for CIOs in Portuguese largest companies.

In the first question the CIO was requested to give a percentage of the total amount of time for each of the individual activities and in the second question she/he was requested to classify the importance of the different skills, based on a Likert scale, from 1 to 5, where 1 is the least important skill and 5 the most important skill. In Fig. 1 we can see the answers given, with the time in percentage of the total amount of time spent by CIOs in all their activities.

One can notice an even distribution of the time spent in the different activities, having the six more important a 5% difference between them and the others four a 3% difference between them.

Managing crises appear on the top of the most time consuming activities being responsible for 16% of the time spent by CIOs in their day-to-day work. We could argue that this is due to the lack of strategic planning, and sometimes it is, but beyond that, we most recognize that the huge quantity, diversity, diffusion and impact of IT/IS solutions in organizations, not to mention legacy systems, ends in many situations with the CIO putting out fires across the organization.

Interacting with TMT is the second most time consuming activity for the CIO occupying 14% of their time followed closely by the activity of making strategic decisions with 11% of CIOs time. This is probably due to the hierarchic position of the CIO in the organization structure. According to CIO Magazine, 42% of today's CIO's report directly to the Chief Executive Officer (CEO) and are part of the TMT [4].

Since the 90s, the outsourcing phenomenon has been changing the nature of the CIO job and that's why we expected the activity of interacting with IT vendors and service providers to be one of the most time consuming as it happens. About 12% of the CIO time is spent in this activity.

Managing projects (13%) and managing application development (11%) together account for 24% of the CIO time spent appearing, if combined, in the top position. When comparing to CIOMAG results [4, 15] we found a great difference, in this activity, between Portuguese CIOs job and their international counterparts job.

From the other identified activities, those that occupy less of the CIO time are interacting with clients (5%) and budgeting (4%).

Fig. 1 – CIO's most time consuming activities

Fig. 2 - Skills most pivotal for the CIO job

The second aspect we tried to clarify with this survey is which are the most pivotal skills for the CIO to perform her/his job successfully. So we asked the CIOs to classify the skills listed on *Table 2*, according to the level of importance for their profession using a Likert scale, where 5 is the most important and 1 the least important. Fig. 2 shows the results obtained, with the mean.

Understanding business processes and operations was considered by the CIOs as the most important skill for their performance. Today, IT/IS importance and impact in the development of the organization business is well recognized and accepted. It is the role of the CIO to understand the reality of the organization and its business in order to develop the right IT/IS strategies and solutions, which will leverage the organization business. The second most important skill is the ability to communicate effectively. This is a very important skill for the CIO performance as of any manager, independently of the functional area of the manager.

It is important to notice that only 28% of the identified skills are related to technical expertise and that they occupy the least important places on the ranking of importance of the skills. Two examples of this are the ability to follow technology innovations in the fifth position and the technical proficiency in the sixth position. This is in line with the study made by CIO Magazine
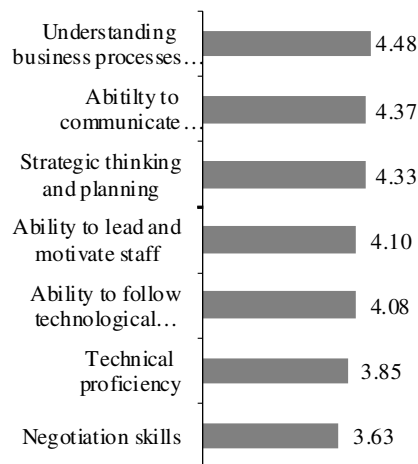
where it is shown that the CIO is first a business man and secondly a technical expert [4].

Independently of the position that these skills occupy it is important to notice that all the skills were classified as important by the CIOs, since the value that occurs the most frequently (mode) is 4.

Portuguese CIO's and of their international counterparts have much in common. This is particularly true when we consider the skills that they need, although we did find some differences in the activities performed.

Finally, it is also important to mention that none of the respondent CIOs suggested a new activity or skill, which shows that the activities and skills chosen for the survey were well suited.

5. Limitations
The primary limitation of this research, as others studies that use a similar research sample [40, 41, 44], is that the results cannot be generalized to all business. It is true that large organizations generally provide leadership in using information technology, but differences do exist between small and large business [40]. Therefore, careful use of the results should be made, especially as to their applicability to small businesses.

6. Conclusions
The findings of this study reveal that the CIOs in Portuguese largest companies spend most of their time managing crises, managing projects and application development and that the most pivotal skill they need for their profession is the ability to understand business processes and operations.

Concerning the skills CIOs need to perform their job, the two most important were the ability to understand business operations and the ability to communicate

effectively. This is crucial to assure the right planning, development and management of information systems. None of these skills is easy to learn and some take years to master. A successful CIO must take the time to develop them.

When comparing with their international counterparts we found that Portuguese CIOs activities and skills have many similarities. Regarding the performed activities, one of the major differences we found has to do with project management, having Portuguese CIOs spending much of their time with this kind of activity.

Finally we believe that our study contributes to a more clearly view and understanding of the CIO role and to a new line of research, in Portugal, devoted to the CIO profession, which is one of the key enablers of the information systems success.

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Appendix A – Survey questionnaire

Which personal skills are most pivotal for your success (Where 5 is the most important and 1 the least important)?

	5	4	3	2	1
Ability to communicate effectively	○	○	○	○	○
Strategic thinking and planning	○	○	○	○	○
Ability to lead and motivate staff	○	○	○	○	○
Understanding business processes and operations	○	○	○	○	○
Ability to follow technological innovations	○	○	○	○	○
Negotiation skills	○	○	○	○	○
Technical proficiency	○	○	○	○	○
	○	○	○	○	○

How do you spend your time (Percentage of the total time)?

Interacting with top management team	%
Making strategic decisions	%
Managing application development	%
Managing projects	%
Optimizing business processes	%
Hiring, developing and managing the IT staff	%
Interacting with IT vendors and service providers	%
Managing crises	%
Budgeting	%
Interacting with customers	%
	%