THE CORE SKILLS OF THE CIO WE NEED

LAS HABILIDADES CLAVE DEL CIO QUE NECESITAMOS

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ABSTRACT: Currently, organizations depend on their Information Systems and Technology Systems (IS/IT) functioning normally, as well as the innovative processes that can arise from them. However, the current performance of the CIO (Chief Information Officer) can be questioned when one contrasts his role as the one responsible for the administration of opportunities given by IS/IT, and the business value added by those technologies. In such a scenario, we pose the question of how the IS/IT professionals acquire articulated competencies and skills that prepare them for the CIO position. In order to elucidate an answer to our question, we interviewed professionals in the CIO position, and surveyed an array of prestigious graduate programs from the USA, European Union and Asia. The most relevant findings of our study report an operational view towards the CIO in the academic formation as well as in the roles that organizations assign to the professional.

KEYWORDS: Chief Information Officer, IT Performance, Value Adding.

RESUMEN: Actualmente, las organizaciones son dependientes del funcionamiento normal de sus Sistemas de Información y Tecnologías de Información (IS/IT), como asimismo de los procesos de innovación que se pueden desprender de estos. No obstante, el actual desempeño de los Gerentes de Información y Sistemas (CIO) puede ser cuestionado cuando uno contrasta su rol como responsable por la administración de oportunidades dadas por IS/IT, y el valor agregado al negocio por las tecnologías. En tal escenario, nos preguntamos: ¿cómo los profesionales en IS/IT adquieren competencias y habilidades de manera articulada que los prepare para la posición de CIO? Para elaborar una respuesta a esta pregunta, entrevistamos profesionales en la posición de CIO y revisamos un amplio espectro de prestigiosos programas de postgrado en EE.UU., Unión Europea y Asia. Los hallazgos más relevantes del estudio revelan una visión operacional hacia el CIO, tanto en su formación académica como en las funciones que las organizaciones le asignan.

PALABRAS CLAVE: Gerente de Información y Sistemas, Desempeño de TI, Valor Agregado.

1. INTRODUCTION

Organizations today can develop capabilities and competitive advantages using Information Systems and Information Technologies (IS/IT); however, the current performance of the Chief Information Officer (CIO) as the responsible one for the administration of opportunities to add value through the use of IS/IT demands a new strategic vision that expands his role from the operational continuity to the development of capabilities and competitive advantages.

The opportunities to implement Information and Communication Technology (ICT) and improve business processes are spread all over organizations [1]. Such peculiarity makes it difficult to clearly define the roles and responsibilities of a CIO. Therefore, since the

impact of information systems (IS) works out currently in all the areas of an organization, it is required that any CIO has not only technical knowledge on ICT but also managerial capabilities and communication skills. All these skills must be acquired and developed by the CIO, during his/her university education, in professional careers and graduates, as well as in the practical development of his/her own profession.

When looking at the professional formation of the CIO, we can find a wide array of backgrounds [2]. Currently in Chile, a big number of IS executive roles are performed mostly by civil engineers, computer scientists, and business managers, professions in which we recognize strengths and weaknesses in the academic formation for the CIO role. Civil engineers and computer scientists tend to be highly skilled in productive processes and technical aspects of technology, respectively, whereas business managers are savvy in defining business strategies. While the technically experienced professionals often lack the strategic vision, managers tend to fall short in the skills to understand and use technical capabilities. For all the reasons above mentioned, we believe there is room for improvements in the formation and training of professionals by endowing them with business, technical, and managerial capabilities.

In the debate of what would be an optimal formation of CIOs, academic entities face the challenge of defining and articulating robust, coherent, rich, and attractive programs that integrate and balance the set of skills for a successful professional positioning in the CIO career. Similarly, IS/IT professionals struggle with the election of the career path and complementary education that will make them succeed in their jobs. On the one hand, individuals need to acquire the ability to integrate strategic and operational aspects, and on the other hand, to combine aspects of business and technology in a single whole.

In this sense, it is necessary to understand that this is not about people being trained in the technology area require an MBA to obtain business skills or a determined perspective; or

professionals in the business area require a Master in Information Systems to be able to know about ICT in depth. It is highly demanded that universities are able to offer programs that integrate the current relation between business and ICT, being able to generate professionals that show an operational view of technology as well as a strategic view that generates business value.

2.   STATE OF THE ART

Although the desirable characteristics to be a CIO can be many, a great CIO can be described as the highest ranked IS professional capable of aligning the business and IT worlds and, like a communicator, skilled to lead and motivate staff [3] with broad corporate perspective and influential in organizational strategy [4].

Despite the common vision of several authors regarding the strategic function of the CIO, issues concerning the effectiveness of IS and its contribution to business value are widely reported. From technical causes like difficulties to maintain costly applications [5] to problems originated in the IS lifecycle administration, such as failure to meet budget, time, and functionality [6] or the unmet performance in assisting decision making [7], the symptoms evidence a lack of vision and understanding of business requirements and the operational dependency of processes on information systems [6-8]. These types of problems could be partially explained by a poorly integrated academic formation and career track, undermining the credibility and support for the CIO at the C-level [9].

Different CIO styles have been identified in the literature to represent the hiring available options of a company according to corporate needs, objectives or maturity [4, 10]. McCue [11] identified four types of CIOs; two company insiders and two outsiders. In his work the insiders are called *professional* and *executive CIOs* who are the two most traditional types that people have in mind. The first is a professional who gained the position after years by their own merit, while the second is usually transferred from some other executive position in the company.

Regarding the outsiders, the *paratrooper CIO* is a strong and independent outsider who is hired when major changes are necessary and stays until the mission is accomplished; finally, the *consultant CIO* refers to an outsider with vast experience and customer orientation that comes to build relationships and trust in the IS/IT group. All these types of CIOs should develop their work in the same direction, which is to support the fulfillment of strategic targets to ensure the efficient completion of business operations.

No matter what the CIO style is, many researchers and practitioners agree on the factors that can make a top IS executive a great CIO. It has been recommended that the CIOs should be business people first, and IT people second [6], who understand the business like a CEO [12], think strategically to support decision making [9, 13, 14], leverage IS/IT investment and earn trust in the organization [5, 13, 15] by demonstrating and communicating contributions to business value not only through operational availability of information systems, but also through alignment and leadership of the IT strategy to the core business processes [2, 13-16].

Successful CIOs have followed different paths ranging from academic formation in business and technology, to learning related with backgrounds in programming, accounting, psychology, engineering or sales [2]. Again, the question we pose is: How can the IS/IT professionals choose integrated academic programs that prepare professionals with strategic vision, who are comfortable developing and implementing IS/IT solutions as well as demonstrating and communicating the business value of such projects?

3. METHODS AND RESULTS

In order to discover the core skills of the ideal CIO, we collected and analyzed data through semi-structured interviews, and public information of graduate academic programs.

3.1 Semi-structured interviews

The primary data collected with semi-structured interviews provides a rich picture of what the roles are and issues concerning the performance of the CIO. The interviews conducted were analyzed as empirical evidence to validate the relevance of the issues reported in the literature, and to serve as a basis for building a new theoretical explanation of the phenomenon under study [17]. A predefined list of responsibilities was adapted from "The State of the CIO 2009 survey", which is periodically conducted by the CIO Magazine with a large sample of IT senior executives in North America.

Six interviews were conducted face-to-face with Chilean key informants representing different industries and companies of different sizes. Approximately 2 hours and 50 minutes of conversations were digitally recorded and analyzed with the consent of the interviewees. Additionally, six other respondents answered the same set of questions on a paper-based format. Table 1 shows the academic formation of respondents (three of them classified as CIO outsiders and three as insiders).

Table 1. Academic Formation of the sample

Outsiders CIO	
Case A: CIO retail sector	Engineering degree in Computer Science, Master in Marketing and Business
Case B: CIO financial sector	Civil Industrial Engineering.
Case C: CIO mining sector	Engineering degree in Electrical Engineering
Insiders CIO	
Case D: CIO education sector	Engineering degree in Computer Science
Case E: CIO retail sector	Civil Industrial Engineering, Engineering degree in Electrical Engineering.
Case F: CIO IT sector	Engineering degree in Electrical Engineering, Master in Business Administration.

The average working experience of the interviewees is 19.3 years, and 7.7 years in the CIO position. In the course of the conversations, the interviewees were surveyed about the functions and roles performed by CIOs in Chile, types of performance assessment in

organizations, different capabilities necessary for a good performance, ways to acquire those capabilities, and the roles assigned to the CIO by the organizations.

Respondents recognized responsibilities in most of the areas shown in the survey: The State of the CIO 2009. In addition to the areas of responsibility, respondents were asked to select and rank, from a pre-defined list, (at least) five activities with priority in their agendas. The activities ranked by our six respondents (one being the most important) are grouped by the frequency of appearance and the importance given by them (Table 2).

Table 2. Ranking of activities in the CIOs' agendas

Tasks in the CIO agenda	Outsiders CIO			Insiders CIO		
	A	B	C	D	E	F
Reduce operating costs.	5	4		1	1	1
Implement best practices.	3		5	5		2
Drive innovation in business processes.	2	5			4	4
Set technology investment priorities.	6		2	3		3
Manage customer relationships.		6	4	6	3	
Improve security/risk management.	4	3				5
Select vendor-offered solutions.			1	4	5	
Improve quality of products and services.	1	2	3			
Reengineer core business processes.			6		2	
Configure information systems.		1		2		
Acquire and retain customers.						
Improve end-user workforce productivity.			7			
Support globalization.						
Enable regulatory compliance.			8			

A: CIO retail sector   D: CIO education sector
B: CIO financial sector   E: CIO retail sector
C: CIO mining sector   F: CIO IT sector

In the rankings we observe bias in the Chilean case, both CIO, insiders and outsiders, favoring operational activities more than strategic ones,

and was the most mentioned and ranked first: reduce operating costs, implement best practices, drive innovation in business processes, set technology investment priorities. Other activities affecting the business strategy were either mentioned as relevant for technology-based industries (improve quality of products and services, improve security/risk management, manage customer relationships) mentioned by half or less of the sample (select vendor-offered solutions, reengineer core business processes, configure information systems, improve end-user workforce productivity, enable regulatory compliance), or simply not mentioned (acquire and retain customers and support globalization). It was pointed out that the importance given to the activities selected can vary according with the global circumstances, in particular, it was mentioned that to reduce operating costs is a priority defined by the 2008-2009 financial crisis. To the list, our respondents added responsibilities in processes design, and auditing.

Regarding the performance assessment of the CIO and the IT department, we discovered that organizations do not usually evaluate IS/IT projects with an established business criterion. They rather assess development and implementation of IT projects using measurements like budget, development timeframe, and up-time, but the IT projects are seen like expenditures, and it is rare to find organizations that measure IT projects by the contribution to fundamental business needs in terms of performance, efficiency or revenue. Rather, it is more common that the CIO manages a budget to accomplish the IT strategy in capacity planning, operations and support.

Facing the question "what kinds of abilities have been more valuable for your performance as a CIO?" our interviewees strongly agreed that both, technical and managerial skills are necessary. Even more, they weighted the importance of both types of skills for a successful performance equally. One CIO interviewed acknowledged a weakness in his own development of managerial capabilities, and a change of vision after some failures. He expressed having a strong background in technical knowledge about IT, but mentioned a

case where after very hard work a successfully developed and installed project was barely used, just because the communication and relationship with the end user failed. Other interviewees stated that a successful leader at the C-level must be a good motivator, see the business through the CEO's eyes, develop decision-making skills, and cultivate abilities to manage human resources.

When asked about the ways to acquire the two sets of skills necessary for optimal performance of the CIO, two visions emerged. One, and the most frequent answer was to obtain the skills through formal education in both areas, for example, with an engineering degree or studies in computer science courses in technical aspects of IT, plus an MBA to complement it with managerial capabilities. The formal education approach presupposes an immature student who will not be able to integrate all the pieces to formulate a systemic vision, and therefore, will need to complement and receive such vision in a graduate program. A very different perspective is to develop both sets of skills as early as possible, hopefully in high school, but definitely in undergraduate studies. Such perspective acknowledges a not fully formed student, but is based on the premise that the skills taught will be further developed with practice.

In the last part of the interview respondents told us what they understand as the expectation of organizations for their performance. In their own words, they see themselves as *"individuals that keep transactional systems healthy"*, and described the perception of other members of the organization: *"IT departments are seen like support areas that don't generate revenues, just support other revenue-generating areas"*.

From the data, we clearly recognize a view towards the CIO as a technology operator. Such a perspective can be explained in many different ways, but the problems reported in the literature coincide with what we have observed. Admitting exceptions, we believe that the main cause of underperformance is the poor business vision, deficiencies in communication skills with users at all levels, and lack of initiatives that could leverage the performance of today's CIOs, aggregating business value from IT.

3.2 Trends in education

- With the purpose of exploring how prestigious universities build the CIO vision among their students around the world, we chose a dozen graduate level programs. The programs were selected from local rankings in North America, Europe, and Asia. We acknowledge that the rankings may not be comparable to each other, but in spite of the differences, we considered the twelve world-class programs as homogeneous for our task.

Table 3 lists the programs analyzed.

Table 3. Academic programs in IS (USA/EU/Asia)

Institution	Program
MIT Sloan Management	Master of Business Administration
Carnegie Mellon Heinz College	Master of Business Administration
The University of Texas at Austin, McCombs School of Business	Master of Business Administration
The University of Arizona, Eller College of Management	Master of Business Administration
Universität Münster	Master of Science in Information Systems.
Universität Siegen	Master of Science in Wirtschaftsinformatik.
Universität Karlsruhe	Master in Informationswissenschaft.
Universität Bamberg	Master in Wirtschaftsinformatik.
National Taiwan University, College of Management	Master of Business Administration in Information Technology Management.
Seoul National University	Master of Business Administration in Information Technology Management.
Auston Institute of Management, Singapore	Master of Business Administration in Information Technology Management.
The Hong Kong University of Science and Technology	Master of Science in Information Systems Management.

The courses of the programs selected were classified in three dimensions describing managerial, technical, and hybrid fields related to IS. All the programs visited offer courses in

the dimension business informatics, which are considered as integrating courses, and deserve deeper analysis in the context of this research. The business informatics courses were further separated in: (a) introduction to business informatics, (b) IT and process governance, (c) business processes design, (d) IT implementation, and (e) data and process mining.

The programs were analyzed in the proportion of courses offered in each dimension, while, at the same time, the objectives of each program were contrasted to recognize if there is an explicit statement of integration and alignment of business and technology. A relatively low proportion of courses in business informatics can be interpreted as having a low integration level; notwithstanding, a high weight in business informatics does not guarantee the strategic, integral, and balanced set of skills to exploit opportunities through the use of IS/IT.

Table 4 summarizes the proportion of courses offered in each dimension. As the courses descriptions explain the contents found on web sites from corporate universities, it was straightforward to determine the dimension to which they belong.

Table 4. Proportion of courses offered by area

Program (USA/EU/Asia)	Courses proportion							
	Business Mgmt	Comp Science	Business Informatics					Number of courses
			Intro	Gov	Proc	IT impl	Data	
MIT-MBA	-	-	17%	67%	-	17%	-	6
CARNEGIE-MBA	36%	14%	14%	14%	9%	14%	-	22
TEXAS-MBA	29%	-	-	43%	14%	-	14%	7
ARIZONA-MBA	23%	4%	4%	19%	8%	38%	4%	26
MUENSTER-MASTER	-	-	-	31%	13%	31%	25%	16
SIEGEN-MASTER	-	54%	4%	-	-	43%	-	28
KARL-MASTER	23%	-	-	-	-	77%	-	13
BAMB-MASTER	38%	-	25%	-	-	38%	-	8
TAIWAN-MBA	35%	41%	12%	6%	-	6%	-	17
SEOUL-MBA	-	7%	27%	20%	-	40%	7%	15
SING-MBA	63%	-	-	13%	-	25%	-	8
HONG-MSc	32%	9%	14%	9%	-	27%	9%	22
Total	**21%**	**15%**	**9%**	**14%**	**4%**	**31%**	**5%**	**100%**

Business Mgmt: Business Management   Proc: business process design
Comp Science: Computer Science   IT impl: IT implementation
Intro: Introduction to business informatics   Data: data and process mining
Gov: IT and process governance

On average, 63% of the courses surveyed belong to business information systems, 21% to business management and 15% to computer science. Such a relatively high proportion in business informatics implies an emphasis on articulating contents for business and technology.

Approximately 31% of the total courses classify as IT implementation, evidencing a focus on IT implementation for business problems as the nexus between business and technology, followed by Introduction to business informatics (9%), IT and process governance (14%), data (5%) and business process design (4%).

Unlike most American programs, the European and Asian programs do not pay attention, in general, to topics such as business process design or IT and process governance.

To some extent, it seems to be that the American programs cover a greater number of courses on business informatics. Despite this, it is not possible to establish that due to this they achieve a better joining of contents in the business and technology area.

In addition to the composition of programs, we analyzed and compared the learning objectives of each program. In this manner, four types of objectives were clearly recognized, depending on the explicit statement of a need for a method to integrate as follows:

A-1: Capabilities to face complex problems with a significant leadership attitude.

A-2: Capabilities to face complex problems with a significant technical approach.

B: State the need to integrate business and technology without declaring what are the important aspects.

C: State the need to integrate business and technology and indicate what the important aspects are, stating that business processes are the main axis.

According to the objectives declared by the universities and the categorization presented, we classified the twelve programs in the corresponding categories (Table 5).

Only one of twelve of these leading programs declare the integration of business and technology one main objective (Type C) and indicate the concrete aspects they believe necessary to accomplish the alignment. One key aspect of this program is the study of business processes.

Seven other programs (Type A-1) declare strong formation in leadership capabilities for identifying and solving problems; however, Type A-1 does not emphasize technical

capabilities to develop and establish leadership, a fact confirmed in the high proportion of courses offered in IT and process governance and business management with a small percentages found in IT implementation courses.

Table 5. Programs classification by learning objectives

Program	Declared learning objectives			
	A-1	A-2	B	C
MIT-MBA	✔			
CARNEGIE-MBA			✔	
TEXAS-MBA			✔	
ARIZONA-MBA	✔			
MUENSTER-MASTER	✔			
SIEGEN-MASTER				✔
KARL-MASTER		✔		
BAMB-MASTER	✔			
TAIWAN-MBA	✔			
SEOUL-MBA	✔			
SING-MBA		✔		
HONG-MSc	✔			

A-1: Focus on leadership

A-2: Technical orientation

B: Recognize need for courses integration

C: Identifies need and method for integration

The other four programs are divided equally between the programs classified as A-2 and B, the first highlighting the development of technical skills mainly for their graduates. In the case of programs classified as B, both recognize the need for a greater joining between business and technology without responding to how to develop such integration.

Undoubtedly, the characteristics of the programs proposed for the analysis in this study are diverse, although they have common characteristics in terms of the courses developed in the business and technology areas, few achieve the joining necessary to provide the market with professionals with a vision of management of IS/IT that supports the integration of business value along with the operational maintenance of the systems.

4.   CONCLUSIONS

As one key role in today's globalized and technologized world, the CIO position in a company must be performed in such a way that value is added through the strategic use of IS/IT.

The empirical data collected in the present study confirms the current nearsighted focus on operational continuity that companies command of the top IS/IT executives. The data also reveals that the CIOs are assessed mainly by the operational continuity of IS, and the implementation of technological solutions, but not necessarily by the business value contribution of IS/IT, and therefore the incentives for a proactive participation in the business strategy at the C-level are low.

Related to how CIOs' performance and contribution are measured, the question remains whether CIOs are not prepared for greater involvement in the corporate strategy design, or is the organization which neither allows nor expects assistance beyond the operational continuity.

Our perspective is that *the core skills of the CIO we need* must respond not only to technical and operational responsibilities, but also to strategic alignment and value adding from IS/IT for the business model. One major shortfall of the current practitioner CIO is that he/she does not respond to the new economy challenge of managing the information resources with a strategic business vision. The former can be partly explained by an almost exclusively technical formation, which does not integrate nor balance the ICT skills with the business reality.

Individuals seeking an integral formation for the CIO position should acquire and develop technical and business skills, and integrate them in a coherent and harmonized fashion. In this sense, the election of academic programs and career tracks should follow the logic of integrating technical skills with business and managerial abilities.

Organizations hiring or training IS/IT professionals for the CIO role will find it useful to check on the individual´s profiles and verify that potential applicants to the position posses the optimal combination of core skills that assure a good performance and add value to the business.

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