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The evolution of the CIO profile: Evidence in Chile

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Abstract

The great and dynamic possibilities offered by the information technologies (IT) impose new challenges to the organizations. The new capabilities of IT demand that the skills and abilities of the people in charge of the technological management evolve accordingly. In this context we are intrigued by what is the evolution of the Chief Information Officer (CIO) that endows him/her with the capacity to face such challenges? Are there patterns in the evolution of the CIO profile? To answer these questions we integrated the definitions in the literature for the ideal CIO profile with the academic programs of prestigious universities in a conceptual map. Then we interviewed 26 CIOs working in Chile to contrast their profiles with the conceptual map. From the literature review we found several prescriptive features regarding the profile and role of the CIO in modern organizations. Differences were found between the ideal role and the evolutionary status of Chilean CIOs. In spite of the differences, we found patterns for the evolution of the profile that allowed us to propose hypotheses and recommendations for the evolution of Chilean CIOs. Finally, we believe that this paper offers a powerful diagnose of the CIO profile to be used by organizations, IT professionals and universities to set professional and academic paths for success in the IT leading position.

Keywords

Chief Information Officer, Business value of IS/IT, Strategic IS/IT planning and management.

1. Introduction

Over the last couple of decades, several organizations have developed great capabilities using information and communication technologies (ICT). Opportunities to improve business models through the implementation of information systems and information technologies (IS/IT) are spread throughout organizations to improve workforce productivity, create IT-based products and services, re-engineer business processes, reduce operating costs, support

expansion and connectivity, improve security/risk management, or support the decision making (Weil, 2009). Then, the role of the person responsible for the administration of the informatics platform and services, the Chief Information Officer (CIO), becomes critical for the organizations that seek to capitalize the potential benefits of ICT in an especially dynamic environment.

Along with the rapid evolution of ICT, the role of the CIO –designing and implementing systems and technologies for information storing, processing and exchange– has also evolved. During the first years of use of IS/IT in organizations, CIOs performed a more technical role to set up the machines and applications that semi-automated large calculations (Chun & Mooney, 2009), especially in administration and finance departments. As the capacity and power of computers evolved, and the costs decreased, companies invested more and more in ICT with the ideas of reducing human errors in manipulating data, and enriching the analysis and reporting of datasets. In such context, the role of IT departments was commanded by technicians capable of understanding how to connect and operate the electronic elements and the complex computer languages. Over time, the evolution of the use of data to information to knowledge supported by information technologies (IT), increased the importance of IT management in the business models, becoming a crucial tool for diagnosing and controlling projects as well as finding patterns in customers' preferences, increasing efficiency in business processes, supporting decision making, and analyzing the evolution of business trajectory in all areas. In addition to the increasing importance of IT and IT management for the business strategy, the pervasiveness and transversal impact of information systems (IS) demands not only technical knowledge from the CIO, but also the acquisition and development of the managerial capabilities and skills necessary to develop a strategic vision and succeed in the position (Chun & Mooney, 2009; Grover, Seung-Ryul, Kettinger, & Lee, 1993; Karlgaard, 2003; McCue, 2006).

All the forces mentioned, apparently demand an evolution of the abilities, knowledge, skills and tools that CIOs must master to better support entrepreneurial processes. The literature describing the roles of CIOs in developed countries, particularly North America and Europe, indirectly attach the evolution of the role with the nature of their own economies, where innovation is a must, and coping with the changes and challenges imposed by the market require an IT leader with technical and managerial knowledge that position him/her at the C-level of organizations. The CIO today is not only a resources manager, but also a participative engine in defining the orientation and corporate goals of a company. The facts mentioned raise our first research question: What is the evolution, in terms of abilities and knowledge that CIOs need today?

The ideal current CIO profile and roles have been treated in the literature (Grover, et al., 1993; Karlgaard, 2003; Rich, 2003; Weil, 2009), but the paths of successful IT leaders, mostly coming from developed countries, are not necessarily true, observable or repeatable in developing countries. Some particularities of the latter seem to demand a more technical vision from the CIOs that although complemented with some basic skills in management, do not require the participation of IT leaders in the strategic development of companies, but demand the administration of the resources and budget defined for ICT areas.

While in the developed countries the academic and professional development of CIOs is derived from a wide array of backgrounds (programming, accounting, psychology, engineering, sales) (McGee, 1998), in Chile, the top IS executive role is performed mostly by civil engineers, and computer scientists; these professions provide strong technical foundations

but not necessarily integrate those skills and knowledge with non-technical abilities necessary for the support of business strategy development. The way in which several Chilean CIOs aim to obtain managerial skills is through the pursuance of graduate studies in business schools, like MBA or Master Degrees. Those programs would endow them with knowledge in similar areas to their pairs in developed countries. However, the researchers' experiences in the field led them to argue against a similar evolution of the Chilean CIO profiles to the described in the international literature, and to ask their second research question. Do Chilean CIOs present a profile evolution similar to that described in North America and European countries?

To answer our first question, we revised the literature about CIOs profiles, and analyzed the academic programs of leading universities that prepare IT professionals, with which we propose a cognitive map for the evolution and complement of abilities that IT executives need for good performance in the market. Then, to answer our second question, the researchers responsible for the study interviewed 26 CIOs working for important firms in Chile. With the interviews, information about academic background, work agenda, and important abilities for the job was obtained with the goal of identifying evolution patterns and mapping their profiles in the cognitive map.

Our results describe a clear evolutionary process for the CIO profile, on which we were able to contrast the ideal status of IT executives described in developed countries as a strategic position intervening directly on strategic decisions, with the Chilean CIOs, for whom the operational continuity seems to be the major focus.

2. State of the art

The increasing importance and relevance of the asset 'information' along with the means to manage it (computer technologies), impose a new vision of the use of IS/IT. The same resource once seen as a transactional element is today regarded as a strategic business weapon that can provide and sustain competitive advantages for a company. Such major redirection of the use of IS/IT implied evolution in several ways. First, once IS/IT permeated all areas in organizations, a great percentage of end users required to learn to use technologies; second, new IS/IT were to be designed considering usability and friendliness concepts; third, more data is collected because most areas register their activities and transactions; fourth, a need to coordinate the efforts and investment in IS/IT emerged; fifth, a business model vision about information assets gains relevance to use information for developing competitive advantages; and sixth, a need to align IS/IT resources and platforms with the business processes becomes evident. The evolving and dynamic trends emphasized the role of the person in charge of leading the innovations, but at the same time manifested the demand for new skills and abilities from the IS/IT professionals (Chun & Mooney, 2009).

Notwithstanding the increasingly shared vision regarding the strategic role of the CIO, issues concerning the effectiveness of IS and their contribution to business value have been also reported (Brynjolfsson & Hitt, 1996; Sobol & Klein, 2009). From technical causes like the difficulty of maintaining costly applications (Welsh, 1991) to problems originating in IS lifecycle administration, such as failure to meet budget, time, and functionality requirements (Ingevaldson, 2009) or unmet performance demands in assisting decision making (Monnoyer, 2003), the symptoms exhibit a lack of vision and understanding of business requirements and the operational dependency of business processes and activities on information systems

(Ingevaldson, 2009; Monnoyer, 2003; Nolan & McFarlan, 2005). These types of problems could be partially explained by a poor definition of the fundamentals in the academic formation and career track, undermining the credibility and support for the CIO at the C-level (Enns, Huff, & Golden, 2003; Watson, 2009) and transpiring the perception to IS end users that many times CIOs are more loyal to the technology than to they are to business (Ingevaldson, 2009). The problems described relate in general to inabilities to manage projects (Ingevaldson, 2009), poor business vision (Monnoyer, 2003; Nolan & McFarlan, 2005), and weak credibility (and therefore influence) at the C-level (Watson, 2009).

Different CIO styles have been identified in the literature (professional, paratrooper, consultant, executive, activist, collaborative, or according to the level that they report) to represent the available options that a company may consider according to corporate needs, objectives or maturity (Grover, et al., 1993; Ingevaldson, 2005; McCue, 2006; Penrod, Dolence, & Douglas, 1990). Regardless of the CIO style, several authors recommend that a "renewed" CIO must first be business-oriented and second IT-oriented (Ingevaldson, 2009; Karlgaard, 2003), must think strategically to support decision making (Kearns & Sabherwal, 2006; Monnoyer & Wilmott, 2005; Nash, 2008; Watson, 2009), understand the business like a CEO (Rich, 2003), and earn trust by demonstrating and communicating contributions to business value not only through operational availability of information systems but also through alignment of the IT strategy to the core business processes (Karlgaard, 2003; McGee, 1998; Mechling, 2009; Monnoyer & Wilmott, 2005; Nash, 2008).

The ideal CIO has been defined as a professional capable of aligning the business and IT worlds and also as a communicator skilled in leading and motivating staff (Feeny, Edwards, & Simpson, 1992). Grover et al. (1993) described the ideal CIO as "the highest ranking IS executive who exhibits managerial roles requiring effective communication with top management, with broad corporate perspective, influence on organizational strategy and responsible for IT planning in a competitive environment". The same article by Grover et al. studied the managerial roles identified by Mintzberg, and verified with a sample of 71 surveyed IS managers that the most relevant roles for a CIO were entrepreneur, spokesman, leader, resource allocator, monitor, and liaison. More recently, Mc Lean (2010) categorized the roles of CIOs according with the focus and type of leadership, and proposed the existence of four types of CIOs: technologist, enabler, innovator and strategist, which could be interpreted as an evolutionary sequence for an ideal IT leader.

With the purpose of exploring how prestigious universities prepare and build IT executives' vision and fundamental abilities, we chose five American, five German and one Dutch program to analyze. American programs were selected from the *U.S. News and World Report* 2009 rankings for information systems MBA programs (US-News & World-Report, 2009). The European programs reviewed come from the Master Program Ranking in Information Systems) published by the German Academic Exchange Service (DAAD, 2009). Also, a prestigious Dutch graduate program was included in the set of programs examined. The two rankings are not comparable to each other. The American ranking system makes statements like "the best program is XY", whereas the German programs are classified in terms of four dimensions that are not comparable to one another. In spite of the differences, we considered the five American and six European world-class programs as homogeneous for our task (Table 1 a,b).

Table 1.a Top American programs in Information Systems

Rank	Institution	Program	Major	Abbreviation
1	MIT Sloan Management	Master of Business Administration	Information Technologies	MIT-MBA
2	Carnegie Mellon Heinz College	Master of Business Administration	Information System Management	CARNEGIE-MBA
3	The University of Texas at Austin, McCombs School of Business	Master of Business Administration	Information Management	TEXAS-MBA
4	The University of Arizona, Eller College of Management	Master of Business Administration	Management Information Systems	ARIZONA-MBA
5	University of Minnesota, Twin Cities (Carlson)	Master of Business Administration	Information Technology Management	MINN-MBA

Table 1.b Top programs in German Academic Exchange Ranking Information Systems

Rank	Institution	Program	Abbreviation
1	Universität Münster	Master of Science in Information Systems	MUENSTER-MASTER
2	Universität Siegen	Master of Science in Wirtschaftsinformatik	SIEGEN-MASTER
2	Universität Karlsruhe	Master in Informationswissenschaft	KARL-MASTER
2	Universität Bamberg	Master in Wirtschaftsinformatik	BAMB-MASTER
3	Winfoline	Master in Wirtschaftsinformatik	WINFO-MASTER
-	Eindhoven University of Technology	Master of Business Information	TUE-MASTER

The courses offered by the programs selected were classified in three dimensions describing managerial, technical, and hybrid fields related to IS. All of the programs offer courses in business informatics, which are considered as courses integrating managerial and technical knowledge; those courses were further disaggregated into: (a) introduction to business informatics, (b) IT and process governance, (c) business process design, (d) IT implementation, and (e) data and process mining.

The contents of the programs were described by the proportion of courses offered in each dimension. Table 2 summarizes the proportion of courses offered. As the course descriptions explain the courses' content, it was straightforward to determine the dimensions to which each belongs.

On average, 67% of the courses surveyed were relevant to business information systems, 19% to business management and 15% to computer science. This relatively high proportion in business informatics implies an emphasis on articulating contents for business and technology. Approximately 36% of the total courses were classified as relevant to IT implementation, evidencing a focus on IT implementation for business problems as the nexus between business and technology, followed by IT and process governance (13%), business process design (6%) and data (4%).

Table 2. Proportions of courses offered by dimension

Program	Proportions of courses							Number of courses
	Business Mgmt	Comp Science	Business Informatics					
			Intro	Gov	Proc	IT impl	Data	
MIT-MBA	-	-	29%	29%	-	43%	-	14
CARNEGIE-MBA	39%	9%	13%	17%	4%	9%	-	23
TEXAS-MBA	29%	-	-	43%	14%	-	14%	7
ARIZONA-MBA	23%	4%	4%	19%	8%	38%	4%	26
MINN-MBA	44%	-	11%	22%	-	22%	-	9
MUENSTER-MASTER	-	-	-	31%	13%	31%	25%	16
SIEGEN-MASTER	-	54%	4%	-	-	43%	-	28
KARL-MASTER	23%	-	-	-	-	77%	-	13
BAMB-MASTER	38%	-	25%	-	-	38%	-	8
WINFO-MASTER	-	48%	-	4%	9%	39%	-	23
TUE-MASTER	31%	3%	3%	8%	11%	42%	3%	36
Total	**19%**	**15%**	**6%**	**13%**	**6%**	**36%**	**4%**	**100%**

Business Magmt: 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

Figure 1 shows a representation of the combination of technical and managerial abilities that according with the literature and the last trends in education, an ideal CIO should have to become a great C-level strategist. The four quadrants in the figure come from McLean's (2010) work, and the axis were proposed by the authors of the present study, based on their comprehension and understanding of the literature revised. Other authors have proposed similar frameworks to compare CIOs profiles, but instead of abilities for the job, have used dimensions to IS strategy (risk averse, risk taker) and IS infrastructure (systemic approach, silo applications) (Chun & Mooney, 2009); on a similar track Willcocks and Griffiths (2010), identified nine core capabilities for high-performig IT functions arranged in three dimensions (business and function vision, delivery of services, and architecture planning and design).
Using this cognitive map of abilities for the evolution of the CIO, we will contrast the state of Chilean profiles for the IT top executives.

3. Methods and materials

Once revised the literature and presented the cognitive map we propose to study the evolution of the CIO profile, we still need to answer our second research question about the state of the Chilean CIO in the evolutionary process. With the principal research objectives of identifying the core competencies of Chilean CIOs and how these competencies are acquired, developed and integrated to succeed in companies, we adopted a qualitative research approach with semi-structured interviews (Bingham & Moore, 1959; Kahn & Cannell, 1957). The qualitative approach allowed us to explore paths of evolution in the profile and to discover from empirical data what competences a CIO needs to master in this position and how experienced people have achieved and articulated the capabilities with formal studies and practice. The qualitative research approach placed the investigators in the real world to interview a diverse sample of

professionals in the CIO position and to interpret the empirical materials (Denzin & Lincoln, 2005). Assuming the social construction of reality, we were interested in participants' perceptions and in common practices as ways of obtaining thorough knowledge of the issue under study (Flick, 2007).
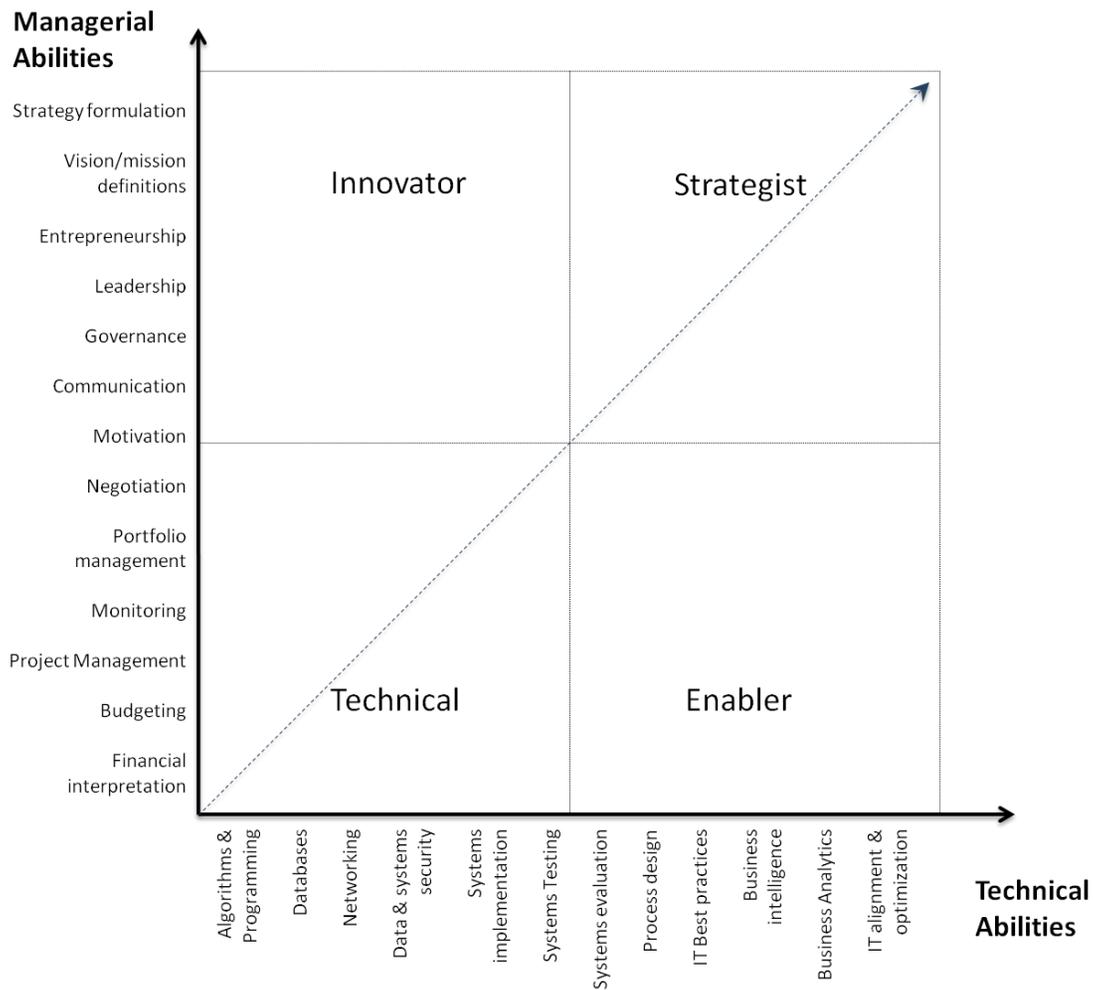

Figure 1. Cognitive map of abilities and CIO profiles. Adapted from McLean (2010) and further elaborated

To elucidate the key competences defining CIOs' performance, we collected and analyzed primary data from Chilean companies as well as data from secondary sources. The primary data were collected in face-to-face and telephone semi-structured interviews, providing a rich picture of the roles, responsibilities and issues relevant for the performance of the CIOs. Kvale (2007) asserts that the interview is a professional interaction going beyond the everyday conversation, becoming a careful questioning and listening approach with the purpose of obtaining tested knowledge. Interviewing is not a neutral exchange of information, it is rather an empathic technique to convince the interviewee to share his/her knowledge (Fontana & Frey, 2005).The interview schedule was sent by e-mail in advance to the participants and then

the topics discussed face to face or by telephone (Kahn & Cannell, 1957). The interviews were analyzed to find empirical evidence by which to validate the relevance of the issues reported in the literature and serve as a basis for building new theoretical explanations of the phenomenon under study. During the interviews, respondents were asked to identify and rank their major responsibilities and tasks. A list of responsibilities and tasks (security, strategy, operations, administration, risk management, customer service, and information and communication technologies) was adapted from "The State of the CIO 2009 Survey", which is periodically conducted by CIO Magazine with a large sample of senior IT executives in North America. The sampling method applied in our research aimed to create a representative set of key informant CIOs from the services sector, but C-level individuals can be considered an elite group, difficult to access because of their low time availability and constraints to disclose information.

Individuals invited to participate in the study were selected from the companies with membership in the CIO Club in Chile[1]. The CIO Club is a non for profit organization that meets twice a month with the purpose of exchanging experiences and knowledge about ICT; only CIOs from large companies can be members of this club. The first attempt to contact individuals in the position obtained a low response rate, with about a dozen individuals responding within the time allowed for data collection. Under such conditions, snowball techniques were used with the first respondents to recruit more interviewees from their social and professional networks.

4. Data analysis and results

The sampling techniques utilized allowed us to conduct semi-structured interviews with 26 individuals in the CIO position with demonstrable experience in the fieldwork. In the course of the semi-structured conversations, the interviewees were surveyed about the functions and roles performed by CIOs in Chile, types of performance assessment employed by the organizations they work for, different capabilities necessary for good performance, ways to acquire those capabilities, and the roles assigned to the CIO by the organization. The average working experience of the interviewees in our sample is 18,4 years and 6,8 years in the CIO position. More than two thirds of CIOs in the sample (69%) achieved the position in the same company they currently worked at the time of the interview, while the remaining 31% was transferred from another company.

Table 3 summarizes the respondent's profiles. Most participants (96%) started their careers with an engineering degree in computer science or industrial engineering, and a high proportion (85%) also complemented their academic studies with a business postgraduate degree. In the postgraduate programs mentioned, Master of Business Administration, Master in Business Process Management and Master in Information Technology Management were declared as the business part of their education. The graduate programs identified offer business oriented tools and capabilities for planning, financial management, and leadership topics

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[1] http://www.cetiuc.cl/difusion/club-cio/

Table 3. Interviewees' profiles

Sector	ISIC code	Academic Background	Years of working experience	Experience as CIO
IT Consulting Company	J 63	Civil Industrial Engineering	10	3
Consulting Company	M 70	Bachelor in Informatics	25	5
Human health Activities	G 86	Civil Industrial Engineering	12	5
Financial Activities	K 64	Engineering d. in Computer Science	24	10
Consulting Company	M 70	Engineering in Statistics + MBA	30	10
Financial Activities	K 64	Bachelor in Informatics + MBA	22	12
Consulting Company	M 70	Bachelor in Informatics + MBA	30	14
Utilities	D 35	Engineering d. in Computer Science + MBA	12	4
Support service Activities	N 82	Engineering d. in Computer Science + MBA	12	8
Financial Activities	K 64	Engineering d. in Computer Science + MBA	28	4
Retail Activities	G 47	Civil Industrial Engineering + MBA	13	4
Financial Activities	K 64	Civil Industrial Engineering + MBA	24	9
IT Consulting Company	J 60	Civil Industrial Engineering + MBA	15	5
Retail Activities	G 46	Civil Industrial Engineering + MBA	16	11
Financial Activities	K 64	Business Administration + MBA	34	20
IT Consulting Company	J 63	Forestry Engineering + MBA	10	6
Utilities	D 35	Electrical Engineering + MBPM	15	3
Consulting Company	M 70	Bachelor in Informatics / Bs. Business Adm.	15	5
Human health Activities	G 86	Civil Industrial Engineering + MBIT	17	8
IT Consulting Company	J 63	Civil Industrial Engineering + MBIT	8	6
IT Consulting Company	J 63	Engineering d. in Computer Science + MBIT	11	6
Consulting Company	M 70	Bachelor in Informatics + MBIT	14	2
Courier Activities	H 53	Bachelor in Informatics + MBIT	20	3
Courier Activities	H 53	Bachelor in Informatics + MBIT	17	6
IT Consulting Company	J 63	Bachelor in Informatics + MBIT	12	2
Retail Activities	G 47	Bachelor in Informatics + MBIT	33	7

MBA: Master of Business Administration/ MBIT: Master in IT Management / MBPM: Master in Business Process Management

Respondents informed responsibilities in most of the areas covered in a list of responsibilities and tasks proposed in our interview schedule (security, strategy, operations, administration, risk management, customer service, and information and communication technologies), and additionally reported responsibilities in process design and auditing. Along with the areas of responsibility, respondents were asked to select and rank the six most relevant activities in their agendas from a list of fourteen usual tasks of a CIO. The ranking of activities provided by our 26 respondents were grouped by the importance given to them, indicating the most important activity as the first in the ranking. Table 4 summarizes the frequency of respondents' identification of priorities in their agendas. Great variance in the election of priority activities was observed, being the activities most reported in the rank: improve quality of products and services, drive innovation in business processes, manage customer relationship, reduce operating costs, improve security/risk management and implement best

practices. On the opposite extreme, the least mentioned as priorities were support globalization and configure information systems.

Table 4. Respondents' ranking of activities in the CIO agenda

Tasks in the CIO agenda	Priority					
	1st	2nd	3rd	4th	5th	6th
Reduce operating costs	-	3	*6*	3	3	*4*
Improve end-user workforce productivity	2	*4*	2	3	3	3
Improve security/risk management	1	1	3	*5*	*6*	1
Drive innovation in business processes	*4*	2	*5*	1	1	2
Improve quality of products and services	*4*	2	3	3	1	1
Manage customer relationships	2	*4*	1	1	1	3
Implement best practices	1	2	2	*4*	2	-
Set technology investment priorities	2	1	2	1	2	2
Reengineer core business processes	3	2	1	-	2	-
Enable regulatory compliance	2	1	-	2	1	2
Acquire and retain customers	2	2	1	-	-	2
Select vendor-offered solutions	3	-	-	1	3	1
Configure information systems	-	1	-	1	-	3
Support globalization	-	1	-	-	-	1

The same activities ranked by the CIOs were also ordered by total frequency of appearance in the ranking (Figure 2), to test if, in spite of the great dispersion in the ranking, it was possible to differentiate the most and the least important activities in the CIO agenda. The most reported priority tasks for the CIO reduce operating costs, improving security/risk management, improving workforce productivity, driving innovation in business processes, improving quality of products and services, and managing customer relationships. These results are partially consistent with the findings in the State of the CIO 2009 survey, where improving workforce productivity, reducing operating costs and driving innovation in business processes are also mentioned amongst the top five responsibilities in the ICO agenda. In our sample, improving security/risk management, and improving the quality of products and services were also chosen as important, although these activities are not usually reported in the literature as priorities. Even though reducing costs is the most frequently reported priority, this responsibility was never mentioned as the first priority for the CIOs interviewed

In order to understand how the CIOs obtained their skills, abilities and vision, the interviews went beyond the participatory methods of ranking responsibilities and posed a series of questions regarding their academic and experiential professional profile construction. In this part, interviewees were asked about their most valuable technical and non-technical skills obtained in undergraduate and graduate studies, as well as what have been the key factors of their positioning as CIOs.
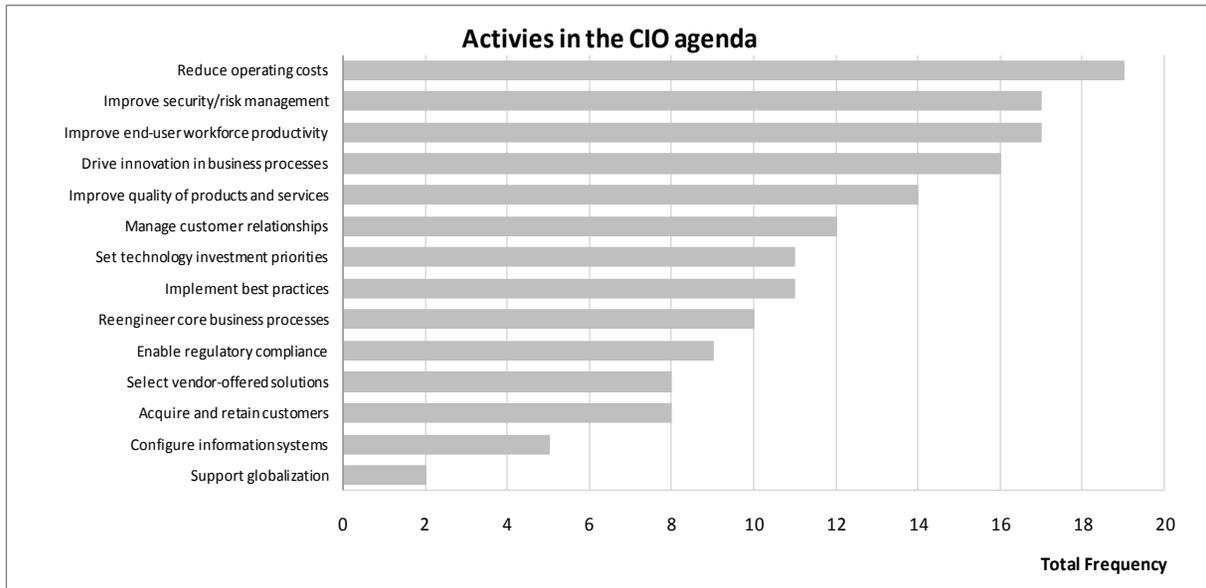
Figure 2. Total frequency of activities reported in the CIO agenda

In response to 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 both skills as equally important for successful performance. One CIO interviewed acknowledged a weakness in his own development of managerial capabilities and considered a change of vision after some failures. He reported having strong technical knowledge about IT but mentioned a case where, after very hard work, a successfully installed project was barely used 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.

From the undergraduate education, technical and 'soft' abilities were identified. The technical ones clearly related to computer science, mathematics and statistics (databases construction and management, programming languages and algorithms, network architecture and settings, technical standards, calculus, algebra, etc). Education in technical aspects of administration like skills in planning, budgeting, strategy, project management and finance were underreported. Those skills were actually the ones most valued from the graduate education, where project management, strategy and planning were described as the most important, followed by investment and finance skills.

Soft abilities and skills were treated differently in undergraduate and graduate programs. The soft abilities obtained in undergraduate programs are collaboration and communication skills, usually developed during the years that the average student spends on campus. Graduate studies provided opportunities for the construction and consolidation of social networking, influence and leadership, features more appreciated after a few years of experience in the labor market.

Two different visions were described with regard to ways to acquire the two sets of skills necessary for optimal performance as a CIO. The most frequent response was to obtain the skills through formal education in both areas, for example, with an engineering degree or

studies in computer science, including courses in technical aspects of IT, plus an MBA to provide managerial capabilities. It is remarkable in this issue that none of the CIOs interviewed see the undergraduate/graduate education as deficient or incomplete, but complementary with graduate studies, and regarding the underreported knowledge declared to have received "at least some of it", but the lack of experience and maturity, and the premature vision of companies' business models and operations did not allowed them to see the value during the undergraduate, making it necessary to complement with MBA-types of continuing education. A different strategy is to develop both sets of skills as early as possible, hopefully in high school, but definitely during undergraduate studies.

The first approach presupposes an immature student who will not be able to integrate all the pieces to formulate a holistic and strategic vision and, therefore, will need to complement and receive such vision in a graduate program. The second perspective, while acknowledging that young students may not be fully formed, is based on the premise that the skills taught at a young age will be developed with practice.

The responses, activities and profiles of Chilean CIOs describe them as technical-enabler types of IT executives. Their academic formation is for the most part technical, and obtained in undergraduate programs, while the managerial abilities and skills are usually obtained in graduate programs. The activities in their agendas indicate a transition from technical towards enabler CIOs, since their target is to support other functional areas in organizations, but not innovate or design new business strategies.

The researchers responsible for the present study discussed about the abilities reported by the 26 interviewees and agreed on approximate combinations of technical and managerial abilities for each. The resulting display of current Chilean CIO profiles is shown in Figure 3.
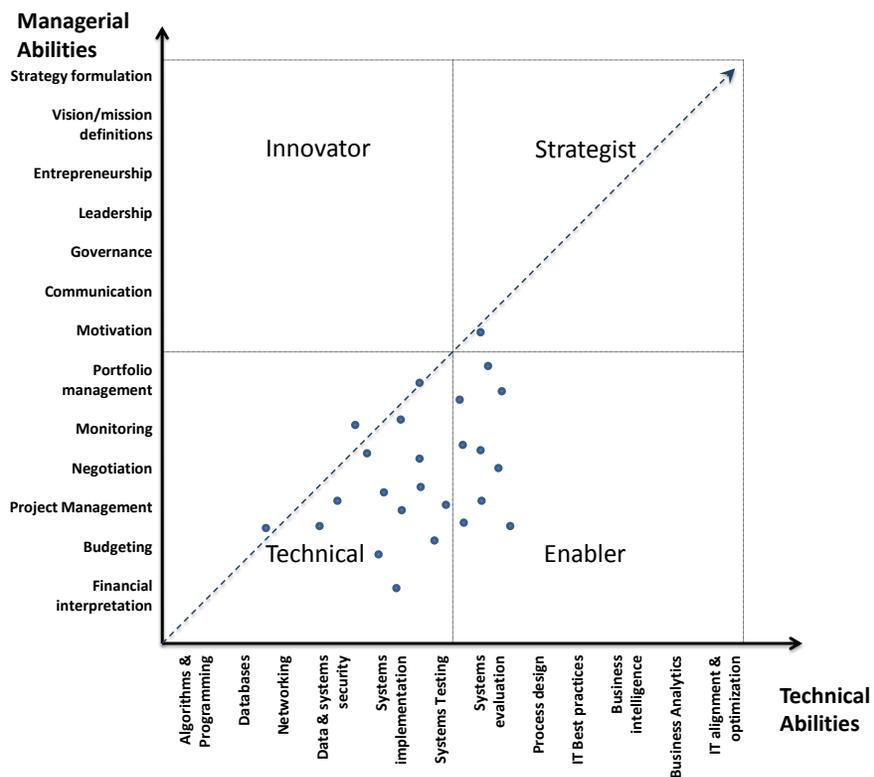

Figure 3. Mapping of Chilean CIO profiles according with the abilities reported

Respondents also told us what they have observed with regard to the expectations of organizations for the performance of the CIO and the types of performance measures that companies use to evaluate their effectiveness. In their own words:

> "I've seen exceptions, but in general the perspective of the CIO is that of an individual who keeps transactional systems healthy. He is also evaluated by the quality and availability of systems" **Consultant CIO**

> "It is ideal to see IT as a strategic unit, but there are several paradigms to break, for example, operational continuity is more important for the CEO than for me" **CIO Retail**

> "A retail business where systems are down at Christmas will fire the CIO because IT departments are seen as support areas that don't generate revenues, just support for revenue-generating areas" **IT services manager**

> "In this institution, technology is not considered too important ... my challenge is to organize the mess we have today" **Education CIO**

In these quotations, we clearly recognize a distinct view regarding the CIO's functions as a technology operator. Such perspective can be explained in many different ways, but the causes reported in the literature coincide with what we have observed. Despite the existence of exceptions, we believe that the principal causes of low performance perception are poor business vision, underdeveloped communication skills with users at all levels, and lack of initiatives that could leverage the performance of today's CIOs and business value from IT, on what depends on the CIO. Other factors like the complexity level of IT departments in organizations, cultural resistance to changes, or end users' vision about IT are beyond the scope of this research, but would also help to explain CIOs roles, success, and position in companies.

Regarding the performance assessment of the CIO and the IT department, we discovered that organizations do not usually evaluate IS/IT projects according to business criteria. They instead assess development and implementation of IT projects using measures like budget, development timeframe, and up-time, which are not necessarily tied to business models; however, IT projects are usually perceived as expenditures instead of investments, and it is rare to find organizations that measure IT projects by their contribution to fundamental business needs in terms of performance, efficiency or revenue. Evidence for this claim was provided by one of our key informants:

> "Each CIO manages a budget. Their business plans are associated with capacity planning, for example, how many stores will I support, what will I do to make sure systems do not collapse in peak seasons like Christmas, and what resources I need to support that" – **RETAIL CIO**

Regarding the measurement of CIO performance and their operational contribution, the questions remain about (1) CIOs are prepared to make greater contributions to the business value and (2) the organizations allow or expect assistance from the CIO beyond operational continuity, both of which could explain underperformance in value creation at the C-level.

5. Conclusions

After surveying the literature and analyzing the empirical data collected, we recognize gaps between the Chilean CIO and "the ideal CIO profile" evolution, who must respond not only to an operational view but also to the strategic alignment and value adding according to what companies actually define and expect from the people playing the role. One major shortfall detected in the cases studied is that the current Chilean CIO does not respond to the new economy's challenge of managing information resources with strategic vision and contributing to business value. The former can be partly explained by many CIOs' exclusively technical or managerial training, which leads to difficulty in integrating or balancing the skills from both disciplines. The same result could be explained by the demand side, where companies measure the IT performance by operational continuity instead of value created. Universities seeking to train competent CIOs should offer both types of courses and integrate them in a coherent and harmonized fashion; in other words, they must develop the articulation concept between technical and managerial abilities.

With the performance measurement systems described by the participants of this study, the incentives for a proactive role of the CIO in the business strategy at the C-level are low. What can be imputed from the interviews is that as long as the CIOs in Chile keep the shop running and spend the budget defined by the company, their continuity in the job is guaranteed; however, the opportunities to capitalize on the strategic use of IS/IT may represent a huge risk for the C-level employee. As experts and scholars in the management information systems field, the authors of this manuscript believe that deficient incentive schemes would cause underdevelopment of CIO skills and capabilities and deliberate passing up of important opportunities to add value.

Several limitations of this study are acknowledged. First, sample obtained could be regarded as small, but the interviews achieved a high degree of saturation, making it sufficient for exploratory research intending to foster the discussion about the capabilities that must be developed in the training of the highest ranking IS executives. Our sample was intentionally biased toward successful and experienced CIOs despite the difficulty of recruiting such a sample; however, it would be interesting to include other cases in the study to contrast the perspectives of other IT executives and CEOs. Future research will consider a larger sample of CIOs from different industries, identifying the corporate needs, objectives and maturity of IS/IT business units. In spite of the limitations of the present study, we propose its use as a guide to motivate discussion and to characterize or propose educational models that prepare students aiming at CIO positions.

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