

CHIEF INFORMATION OFFICER: A JOURNEY THROUGH TIME

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Abstract

Since, the available informational and technological resources constitute a source of prosperity and differentiation for the organizations, the role of the Chief Information Officer (CIO) is becoming more crucial and vital. The thirty years of the CIO's existence have shown a path of changes and difficulties on defining and establishing the particular role within the organizational context. The present study examines the CIO role evolution over the last thirty years. The examination of the evolution of the CIO role identifies four main areas of interest that can be used as a conceptual framework for the CIO role research. These areas relate to business strategy, innovation and competitive advantage, relationships building and external environment. The analysis provides insights about the responsibilities of the CIOs, and how those are affected by the key disruptive technologies in the last thirty years.

1. Introduction

The role of information in organisations is of great importance and it is considered as important, if not more, than the technologies that are used to manage information. Along with land, people and capital, information represents a resource that is able to provide differentiation in a competitive environment and there are many studies in the literature that suggest approaches and provide examples of how information can be used efficiently and effectively. One can argue that the informational and technological resources available to the organisations nowadays are playing now an active role and are driving business strategy in many areas. The existence of the Chief Information Officer (CIO) as a c-level executive provides an indication to the attention that is paid to those resources by the organisations.

The CIO role has changed substantially since it was first introduced in 1981 (Benjamin et al., 1985; Passino & Severance, 1988; Applegate & Elam, 1992; Earl, 1996; Hunter, 2007; Chun & Mooney, 2009). Unlike other c-level executives, the Chief Information Officer still does not have a widely accepted and well defined role model (Lohmeyer et al., 2002; Karahanna & Watson, 2006) or, if they have a clear role, it equilibrates among different profiles (De Barbuat & Labaye, 2008; Preston et al., 2008; Yan & Chuan Hoo, 2009). Several CIOs are members of the board of directors while others report to the Chief Operations Officer or the Chief Finance Officer. Furthermore, some CIOs have the role to promote strategic initiatives, while others in the same post are more focusing on the operations' side of the IT function. So, it can be argued that the main CIOs duty is to equilibrate between strategic decisions and technical implementation.

Motivated by this background, the aim of the present study is to examine the evolution of the CIO role over the last thirty years. The examination of the role evolution takes under consideration the actual role aspects and responsibilities of the CIO post as well as the technology and its influence on the CIO role. There are plenty of examples of technological developments that affected the ways the organisations manage their informational resources and there is a need to examine how those changes have affected the organisations themselves and as a consequence, the CIO role. Thus, the goals of the study are 1) to examine how the CIO role has evolved over the last thirty years in relation to its main role aspects and in relation to technology factors affecting the internal and external organisational environment and 2) to compare those results with similar studies trying to identify the CIO role.

2. Research approach

The CIO aspects and responsibilities documented in the literature since 1981, when the term of the Chief Information Officer (CIO) first appeared (Synnott & Gruber, 1981), are reviewed and presented for each decade in chronological order. These main CIO role aspects and responsibilities are also related to the key drivers of the evolution, the major changes in the industrial landscape and the major disruptive technologies. As a result, the main key themes and challenges the CIOs have faced since 1980s are grouped into seven areas of concern. In addition, two current CIO role models are validated. The outcome of the present study is a CIO conceptual framework that indicates the main CIO role aspects.

3. The Chief Information Officer of the 1980s

The antecedent of the Chief Information Officer was the Information Systems Manager. There is evidence that this role began to change in the working environment. It became more of a manager than a technician. The Information Systems Managers left their technical responsibilities to technical experts, from both internal and external environment (Ives & Olson, 1981). The new activities of their role were coordination, motivation and planning. Information Systems Managers begun to

spend more of their time to plan the overall strategy of the Information Systems function. This change of activities had an equivalent transformation of the Critical Success Factors (CSFs) of their position. The new priorities of the role were the communication, the IS human resources, the reposition of the IS function and the delivered service of the IS department (Rockart, 1982). The IS executives were required to understand the users' needs and explain to them the IS functions. They had to appoint personnel who are managerially competent and able to assist top management team by interpreting their requirements in terms of Information Technology. As the IS function has changed and has been involved in all aspects of the business, the IS managers had to introduce new techniques that allow top management team to use information more effectively than back office systems did so far. In addition, the IS managers perceived Information Systems as a service which implied that they had to consider not only operational but also user's aspects. From the above, it becomes clear that Information Systems Managers' activities were more user-oriented and their responsibility was to transform IS function from data processing to information delivery.

The first attempt to define the main aspects of the Chief Information Officer role was made by the Society for Management Information Systems (SMIS) (Rockart et al., 1982). The members of the society argued that the executive's future role would be influenced by the required attributes of the role and these will be defined by the relevant trends of the business environment. The work concludes that the main aspects of the CIO role would be the diminishing of direct line responsibilities, the increasing staff orientation and the corporate responsibility for information resource policy and strategy (Rockart et al., 1982). The researchers anticipated that the CIOs would be focused on their staff, leaving technical details to departments, of which they would keep the overall control, and they would be strategically involved in the top management team. Those aspects were validated through an exploratory survey of twenty CIOs. It was also found that the CIOs responsibility was rapidly distributed (distribution of IS executive responsibility), their primary goals were accomplished through staff activities and they were aligned to the strategic and operational elements of the business (strategic and operational alignment of IS) (Benjamin et al., 1985). By that time, it was evident that CIOs have an increasing strategic role within the organisation.

Apart from the strategic aspect of the CIO role, another issue emerging during the 1980s. The technology evolution combined with the continuous growth of corporate data made available information an asset. In particular, information resources were seen as a source for competitive advantage. As a result, the new issue of concern for the CIOs was to translate IT into competitive advantage (Passino & Severance, 1988). In broad terms, the CIO role seemed to be moving beyond technology toward business concerns, such as productivity of IS and communication with top management and end users. The study also found that only one out of the top four CIO's concerns is related directly to technology. In contrast, the IS department focus is on communication, training and education of non-IT people within the organisation. Through their concerns, CIOs were also aware of the necessity to quickly respond and handle sudden changes in the business environment. The technology evolution in terms of information processes automation was expected to affect the role of the CIO in the next decade. The characteristics of the technology evolution would lead to new IT management paradigms which would be based on partnership and cooperation (Dixon & John, 1989).

As a result, CIO role should be a partner consultant, a strategy planner and a manager of technology infrastructure in a hybrid structure. His responsibilities would be concentrated on the business use of technology, the delivery of macro financial and competitive benefits as well as on the maintenance of a constructive leadership position in the organisational revolution (Dixon & John, 1989).

A summary of the key characteristics identified in the literature during the 1980s are shown in Table 1.

Author	Year	Aspects investigated	Group
Ives and Olson	1981	more of a manager than a technician	[1]
		coordinator	[1]
		motivator	[2]
		planner	[1]
Rockart	1982	communication	[2]
		IS human resources	[1]
		IS function reposition	[3]
		IS as service	[2]
Rockart et al.	1982	diminishing direct line responsibilities	[1]
		increasing staff orientation	[1]
		corporate responsibility for information resource policy and strategy	[1]
Benjamin et al.	1985	distribution of IS executive responsibility	[1]
		staff activities	[2]
		strategic and operational alignment of IS	[1]
Passino and Severance	1988	communication with top management, functional managers and end users	[2]
		productivity improvement of application system development	[3]
		translation of IT into a competitive advantage	[3]
		development of a quick response capability to handle sudden changes	[3]
Dixon and John	1989	partner consultant	[2]
		strategy planner	[1]
		manager of technology infrastructure in a hybrid structure	[1]

Table 1: The CIO role aspects of the 1980s

Looking at the evolution of the CIO role during the 1980s, we can identify three main characteristics that are essentially groupings of the aspects shown in Table 2 (indicated as [1], [2] and [3]). Firstly, it can be argued that CIOs leave aside the technical focus of their role and concentrate more on the strategic aspect of the IS function through long-term planning. As a result, they obtain a more strategic position within the organisation hierarchy and develop their managerial responsibilities (group [1]). Furthermore, one can suggest that the CIOs focus on the internal communication (group [2]) with the other parts of the organisation and they have to educate the top management team and other departmental managers about the IS function capabilities. A final argument can be that the CIOs start paying attention on finding the appropriate technologies and systems that will bring competitive advantage for their organisations (group [3]).

In addition to the role aspects identified from the literature, it is useful to discuss the major changes in the technological landscape during the 1980s and reflect on the possible effects of major disruptive technologies on the CIO role aspects.

From the literature, we can identify three major technologies that were the highlight during the 1980s, namely, PCs, mainframes and the Windows Operating System as shown in Figure 1 (Carlson et al., 1996). During the early years of the 80s, PCs became widely available and affordable and as a result, started penetrating the business world. At the same time, mainframes were expanding as more and more organisations could afford their development. On the basis of this, the CIO role increased in visibility within the organisation and had to justify investments in IT to senior management, often on the basis of savings in personnel costs but also on the broader and longer term competitive advantages that technology brings with it. Finally, usability of the technology increased substantially through the wider availability of the Windows operating system and related applications. This meant that PCs were increasingly used within the various parts of the organisation to support automation of the office tasks such as word-processing and one can argue that as a result

of this CIOs had to develop their communication channels with larger parts of the organisation and at the same time, develop the appropriate infrastructure for the support of users (larger IT department and managerial responsibilities).

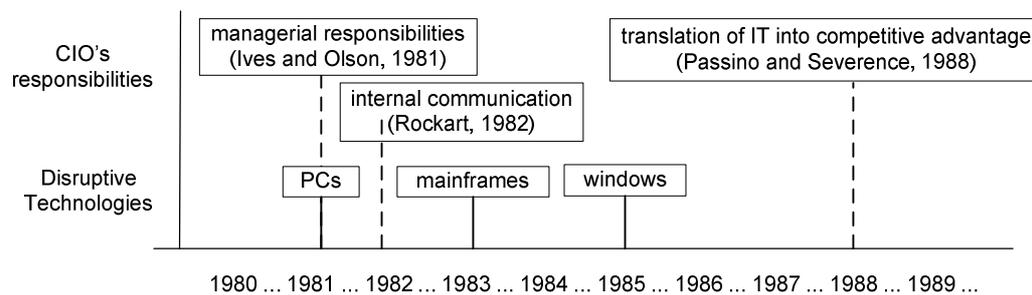


Figure 1: Disruptive technologies and CIO role aspects during 1980s

4. The Chief Information Officer of the 1990s

A first point that can be made by reviewing the literature about the CIO role in the 1990s is that there is an increasing amount of research about CIOs in different sectors. Until now, researchers were mainly interested in private companies and the role of their CIOs (Lawry & Waddell, 2008). But once information resources became crucial for all the types of organisations, the CIO was an integral part of their structure. As a result, research began to examine the aspects of the CIO role in other sectors such as education and, in particular, higher education.

Higher education is an information intensive sector. Its main “product” is knowledge while the majority of internal functions deal with sensitive information. Conducted research examined the relationship between the enterprise CIO and that of the higher education in United States. The results were consistent with previous research. Higher education CIO role aspects were leadership, planning and communication/liaison (Penrod et al., 1990). Three aspects that can be interpreted to similar activities their colleagues in business and industry had.

A new dimension of the CIO role was cited by a study of Australian CIOs. Their inward behaviour in seeking information resources prevented their ability to get ahead of competitors (Watson, 1990). IS executives who wish to bring competitive advantage to their organisations should be innovative and find new ideas. In order to succeed on that, they must scan the environment in a more extended way than their peers (Watson, 1990). They should be able to view opportunities that IT can bring into their organisations, inspired by other fields such as marketing, and they should not focus only on their field area.

The evolving characteristic of the CIO role was demonstrated by a comparison study between newly appointed IS executives and established IS executives (Applegate & Elam, 1992). The study confirmed the trends about the CIO role discussed in the previous decade. Both categories of the IS executives spent sufficient time in IT strategic planning and control (Applegate & Elam, 1992). Nevertheless, newly appointed IS executives dedicate rather less of their time into technical IT issues. According to the authors, the agenda of new generation of CIOs is focused on the link between business and IT strategy. In addition, they are more likely to quickly develop relationships with colleagues across all the levels of the organisation.

Ten years after the “more of a manager than a technician” (Ives & Olson, 1981), a study concluded that CIO is an “executive rather than a functional manager” (Stephens et al., 1992). The new aspect found in the CIO role is the active participation in the strategic planning of the organisation. Despite the planning of the IT department and its functions, CIOs have an active role in the overall

organisation strategy. Their concern is to plan long-term projects and not only day-to-day functioning of the Information Technology unit. CIO is the executive who can bridge the IT group, the functional areas and external entities of the organisation.

A study, based on Mintzberg's classic managerial role model (Mintzberg, 1971), investigated the aspects of the IS manager and how they were related to those of other executives (Grover et al., 1993). In more detail, CIOs see their role as more structured and support-oriented in comparison with the role of finance executives (Grover et al., 1993). They also have informational responsibilities while they need to be alert to technical developments. The aspects of spokesman and liaison role were also identified from the same study. CIOs should develop communication capabilities and talk with people from other departments of the organisation as well. Ultimately, they should collaboratively be part of the external environment in order to update their knowledge and create a wide network. Surprisingly, this study is the first that argues that the strategic aspect of the role is not so important. However, the authors conclude that the role is still not established and needs to be further investigated.

The aspects gaining space in the 1990s decade are the communication and networking skills. With the main objective to be the bridge of the two worlds – IT and the rest of the business – the CIOs spent a lot of their time to inform and convince colleagues about the role of IT in the business (Stephens & Loughman, 1994). At the same time, they have to understand what their colleagues' technology needs are and support them with suitable Information Technology solutions.

In the middle of the nineties, the issue that concerns the managerial world is the performance of the IS and their ability to create business value. The latter emerge attention to research the efficiency aspects of the IS function, the respective department and ultimately the role of the CIO as the leader of the IS projects. A number of IT projects were unsuccessful and if they were not so, they did not meet the time and budget plan specifications most of the times. The result was quite often the CIO role to be under attack. Therefore, research on different sectors indicated a number of CIO role aspects that would improve IS performance (Earl & Feeny, 1995). These aspects are:

- ✓ focus on business imperatives
- ✓ interpret external IT success stories
- ✓ establish and maintain executive relationships
- ✓ establish and communicate IS performance record
- ✓ concentrate on IS development effort
- ✓ achieve shared vision of IT and,
- ✓ make business contribution.

Some of these aspects overlap with each other. The main point that can be argued is that CIOs should be integral part of the top management team and should contribute in effective relationships. They should demonstrate business contribution and their department's efficient performance. Through the above role aspects for improvement of IS performance, it becomes clear that only if CIOs follow a shared vision with business objectives, they will be able to add value to the organisation.

Similar results were discussed about the structure of the IT department or an IT organisation. A set of eight imperatives was proposed as guidelines to adjust the IT structure according to the business, environment and technological changes (Rockart et al., 1996). The areas on which IT organisations should excel are:

- ✓ achieve two-way strategic alignment
- ✓ develop effective relationships with line management
- ✓ deliver and implement new systems

- ✓ build and manage infrastructure
- ✓ re-skill the IT organisation
- ✓ manage vendor partnerships
- ✓ build high performance and,
- ✓ redesign and manage the federal IT organisation.

Those IT imperatives could be considered as the responsibilities of the IT leader, or the Chief Information Officer of an organisation. To summarise, the IT executive should first restructure the IT organisation according to the new business challenges, deliver results that offer business solutions and all these through developing relationships within and outside the organisation.

Similarly to the research on the differences between established and newly appointed CIOs (Applegate & Elam, 1992), another study investigated the factors which could be critical for the CIOs to maintain their position. Ten factors were identified and classified into four categories: personal attributes, organisational context, IS management processes and performance (Earl, 1996). For the purposes of this study, we are interested in the four imperative roles extracted from this work. CIOs were presented as visionaries as they need to proactively plan the IT structure and as deliverers since they still need to deliver the IT solutions. Their strategic position at the top management team is depicted in the tactician role which would be enforced if the CIOs develop the skills to build effective relationships. Based on this research and the evolution of Information Technology, Earl (1996) extended the initial four roles according to future trends. Based on this view, CIOs would need to expand their views outside the IT field and their organisation as systems thinkers. They should not just deliver effective IS but also introduce new technologies and implement new ideas like architects. CIOs active participation in the business strategy would be a necessity and their role will be to suggest change for the organisation's directions (reformer). Therefore, they would be reformers. Finally, as IT developing and outsourcing expands, CIOs would need to be alliance managers with third parties, vendors and users.

The work of Earl (1996) identified eight imperative roles for the CIO position based on critical survival factors. An interesting point is to examine if those roles depict activities that CIOs have identified as the main activities of their day-to-day work. Fifteen activities were sent to CIOs to be assessed and ranked in priority order (Gilbert et al., 1999). The top five activities ranked by CIOs were:

1. align the IS organisation with the enterprise
2. competitive advantage
3. data resources
4. end user computing and,
5. strategic planning.

The highest ranked activity by the CIOs was the alignment of IS organisation with the enterprise. The ability to transform IT capabilities to solve business problems is a job for the tactician and systems thinker CIO. The more technical activities of data resources and end user computing are related to the deliverer and architect role, while strategic planning is clearly a visionary and systems thinker responsibility. However, the creation of competitive advantage is an activity that is difficult to be assigned to one of the above roles. In addition, "relationships building" was an activity that was not under CIOs ranking exercise. Therefore, it could be argued that there is a gap between the proposed CIO role models and the day-to-day tasks that CIOs rank as their activities.

One reason that could explain this discrepancy is the constantly evolving nature of Information Technology. As technology evolved from the mainframe to the web-based era, a specific CIO role model that would last in time and include all the current and potential aspects of the role was

difficult to be captured (Ross & Feeny, 1999). The direct relation of the CIO role to the Information Technology made its identification a hard task for the researchers of IT leadership.

A summary of the key characteristics identified in the literature during the 1990s are shown in Table 2.

Author	Year	Aspects investigated	Group
Penrod et al.	1990	leadership	[1]
		planning	[1]
		communication/liaison	[2]
Watson	1990	wide environment scanning	[5]
		communication/relationship w ith CEO	[2]
Applegate and Elam	1992	IT strategic planning and control	[1]
		IT architecture management and standards development	[3]
		human resource management	[1]
Stephens et al.	1992	executive rather than a functional manager	[1]
		active participant in business strategy planning	[4]
		bridge betw een the IT group, the functional areas and external entities	[4],[5]
Grover	1993	spokesman	[2]
		liaison	[5]
		part of the external environment	[5]
Stephens and Loughman	1994	netw orking	[5]
		communication skills	[2]
Earl and Feeny	1995	focus on business imperatives	[4]
		interpret external IT success stories	[3]
		establish and maintain executive relationships	[2]
		establish and communicate IS performance record	[3]
		concentrate on IS development effort	[3]
		achieve shared vision of IT	[4]
Rockart et al.	1996	make business contribution	[4]
		achieve tw o-w ay strategic alignment	[4]
		develop effective relationships w ith line management	[2]
		deliver and implement new systems	[3]
		build and manage infrastructure	[1]
		reskill the IT organisation	[3]
		manage vendor partnerships	[5]
build high performance	[3]		
Earl	1996	redesign and manage the federal IT organisation	[1]
		visionary and systems thinker	[5]
		deliverer and architect	[3]
		tactician and reformer	[4]
Gilbert et al.	1999	relationship builder and alliance manager	[2],[5]
		aligning the IS organisation w ith the enterprise	[4]
		competitive advantage	[3]
		data resources	[3]
		end user computing	[4]
		strategic planning	[1]

Table 2: The CIO role aspects of the 1990s

Looking at the evolution of the CIO role aspects during the 1990s, we can examine how the previous aspects evolved and what are the new aspects that appeared during this decade. Regarding the managerial responsibilities (group [1]), the CIO develops leadership skills in order to manage the IS department and the responsibilities that he or she diminishes the previous decade. Also, the strategic planning and control of the IS function is now clear that it is one of the top priorities for the CIOs. The internal communication (group [2]) as a CIO role aspect has evolved to relationships

building. CIOs need not only to establish but also to maintain relationships with other executives and for that reason they have to develop communication channels that are not based on IT terminology. In respect to that aspect, relationships with particular roles within the organisation, such as the CEO, are of high importance. Furthermore, regarding the role aspect of bringing competitive advantage through the IS function (group [3]), more emphasis has been given to the IS performance and the new systems that the CIO is responsible to deliver.

During the 1990s, the CIO role evolution is also characterised by a couple of new aspects that appeared those ten years. At first, it can be argued that a new group of responsibilities regards the two-way alignment that is expected between the business and the IT function (group [4]). CIOs are concerned about the business outcome of their IT products/services and to some extent the business impact of their work. Finally, the significant change of the CIO position is the expansion to the external environment (group [5]). In order to succeed at their post, CIOs need to develop networks and alliances with external entities (i.e. suppliers) and adopt successful IT solutions from the wider external environment.

In addition to the role aspects and their evolution identified from the literature, it is useful to discuss the major changes in the technological landscape during the 1990s and reflect on the possible effects of major disruptive technologies on the CIO role aspects. From the literature, we can identify four major technologies that were introduced during the 1990s, namely, client-server architectures, email and web communications and Electronic Data Interchange (EDI) applications, as shown in Figure 2 (Carlson et al., 1996). During the early 90s, IT architectures were redesigned as client-server in order to meet the needs of organisations from the expanding use of IT. In addition, this decade was characterised by the increased availability of email communications and more importantly, the introduction of the first generation of web technologies (HTML, web browser) in organisations. Finally, organisations were linked more directly with other parts of their supply chain through EDI technologies so that they could optimise performance and minimise resource requirements.

On the basis of these technologies, CIOs were asked to develop further their links with other parts of the organisation and in many cases, to initiate communication by explaining the benefits of the new trends in IT to their colleagues and ways that the organisation could take advantage of. This in essence, could be seen as the basis of the two-way communication that not only recognises the requirement for the CIO to satisfy the needs identified but also to point to possible areas for improvement and expansion that the new trends in IT provide. Furthermore, the increased availability of EDI technologies and the web meant that CIOs became more aware of the external environment of the organisation and had to work alongside its suppliers and customers. In order to be able to catch up with the rapid expansion of these technologies and especially, the web, CIOs had to develop better relationships with their peers to be able to understand better what are the possible implications, avoid pitfalls and more importantly, take advantage of possible opportunities that otherwise would be more difficult to identify.

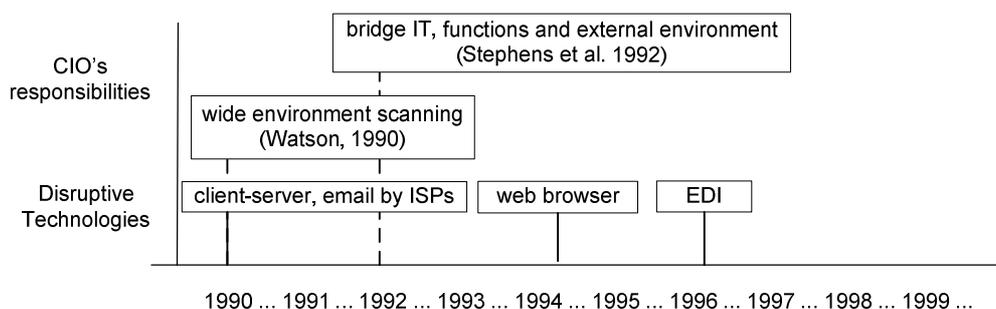


Figure 2: Disruptive technologies and CIO role aspects during 1990s

5. The Chief Information Officer of the 2000s

Entering the new millennium, the CIO position became more prominent in both the private and public sectors. It was exceptional for an organisation not to have to deal with information technologies and therefore, an executive, who is responsible for the management of the informational and technological resources, was somewhere at the organisational chart. This expansion is demonstrated by the increasing number of business reports and studies regarding the public sector and government agencies. Organisations like Gartner, McKinsey, IBM and others carried out studies and published reports about the role of the CIO. At the same time, government bodies realised the necessity to standardise the CIO role through various initiatives such as the Clinger-Cohen Information Technology Management Reform Act and the Sarbanes-Oxley Act.

The Clinger-Cohen Act was the US government attempt to examine how private sector and pioneering public sector organisations assured customer services through effective management of Information Technology resources. A qualitative study about the implementation of the Clinger-Cohen Act in four US federal agencies reveals very useful insights (Buehler, 2000). Although there were dissimilarities between the public agent CIOs, a few common aspects were identified about their roles. At first, government CIOs stressed the implementation of effective and efficient IT solutions, essentially a technical-deliverer role. Also, they argued about their strategic role through the importance of leadership. Finally, the majority agreed that IT was pivotal in supporting the overall mission of their agencies (support organisation's mission statement). These aspects are similar to the ones that have been identified so far in the literature. However, the government CIOs highlighted another issue of concern namely, the realisation of cost avoidance or resource saving.

As the CIO role went through the third decade of its existence, more quantitative and qualitative studies appeared that in addition, addressed deeper levels of analysis. Researchers assume that CIOs role include one or two of the previous stated aspects, and they attempt to investigate how this aspect is achieved. One example of such research study was how CIOs effectively influence their peers (Enns et al., 2000). The results indicated that personal appeal brings a positive outcome whereas the use of pressure led to resistance (Enns et al., 2000). This level of investigation and analysis reveals the importance of communication and relationship building in the strategic role of the CIO.

Ten years after the study which revealed that the strategic role of the CIO was not so important (Grover et al., 1993), another study contradicted this result. It was found that the activities of initiating and designing change (entrepreneur as plan and implement change) in the organisation were number one priorities for the CIOs (Gottschalk, 2002). Those activities are described by the entrepreneur role of Mintzberg's managerial model. Another study, investigates further the role of CIO in relation to the generic managerial model of Mintzberg and it assumes that the generic roles included in the Mintzberg model can be used to define the CIO roles identified in the literature (Sojer et al., 2006). This study proposes a CIO role model that consists of four roles in relation to the strategic impact of current and future information systems on the organisation. This study is based on secondary data and the role aspects are not explained in terms of responsibilities. With respect to Mintzberg's generic managerial role model, it would be interesting to investigate in more detail and in addition to the three previous studies, its relationship with the CIO role models discussed in the literature. This is considered to be a possible future work and outside the scope of this study that focuses on the CIO role and its evolution over the last thirty years.

Until now, not much discussion has been put in place about the technical aspect of the CIO role in this decade. For that reason it is important to quote the outcome of a CIO panel that analysed the Next Generation Enterprise (NGE) (Kishore & McLean, 2002). During the discussions about the shaping of the NGE and the role the technology will play on that, it was argued that leadership capabilities are indispensable in every level of management and mobile technologies will play a

crucial role in the future (Kishore & McLean, 2002). However, CIOs made clear that the technology itself is not the only ingredient that will offer the fruition and the value of information in the organisation. It is cleared by now that technical aspects of the CIO role are not in the highest level of ranking or prioritisation for the CIOs in the next generation. In contradiction, the vital role of Information and Communication Technologies (ICT) assign to the CIO role the responsibility of technical communication (Haselkorn, 2003). Of course, the skills of team-building and the central leadership role focused on strategic goals are still required in order to creatively use information tools.

Since contradictory results were found in the literature about the priorities of the CIO role, researchers quite often began their analysis from the drivers that cause the changes to organisational structures and the CIO role in particular. The rapid strategic business change, the pervasive IT with an experienced user community and the e-business and technology complexity were the identified drivers that make the CIO role to change (Reich & Nelson, 2003). The role of business consultant has expanded to IT people taking more of a leadership role and aiming to identify and quantify opportunities to create business value through IT. The ability of interacting, influencing and negotiating with diverse teams and stakeholders is also indicated for the CIO role. According to the authors, these aspects should be a part of the curriculum not only for management and MIS courses but also for computer science ones.

Emphasis is given during the 2000s to the relationship between the CIO role and the external environment. CIOs need to be cultural and political savvy whilst they need to act collaboratively to understand and communicate with their customers (Weiss & Anderson Jr., 2003). It has been recognised that the nature of the competitive and technological environment forces CIOs to perform within a complex environment by reacting fast and effectively. Finally, CIOs need to act as change agents and more importantly, act collaboratively with internal and external stakeholders.

There are three interdependent, interrelated and universally applicable principles for managing IT effectively. Those principles are undoubtedly top management's responsibility to understand and apply (Feld & Stoddard, 2004). These are:

- ✓ a long-term IT renewal plan linked to corporate strategy
- ✓ a simplified, unifying corporate technology platform and,
- ✓ a highly functional, performance-oriented IT organisation.

The three suggested aspects are also applicable during the high level of IT outsourcing trend. There is a lot of argument about the obsolete role of the CIO because of the increasing outsourcing development. However, as the outsourcing transforms the IT space to a more complex environment, the suggested issues need consideration.

An interesting study conducted by MIT Sloan School of Management (Westerman & Weill, 2004) in which non-IT executives were asked to list the four most important tasks for the CIOs. The study shows the perception of CIOs' colleagues about their role in the organisation. The first four key capabilities that emerged were:

- ✓ operations
- ✓ application development
- ✓ IT strategy
- ✓ infrastructure and architecture

while relationship management was the last one. Despite the fact that CIOs rank the relationships building activity higher among their priorities, their colleagues did not seem to receive this communication effort by the IT executives. In addition, the above ranking shows that the colleagues

of CIOs still believe that CIO's responsibility is restricted to the IT department function. Apart from the operations capability, the other three are limited to the IT department function and they are not directly related to the business objectives.

A different view is stated by a study that shows that the IT managerial challenges remain fairly constant over the years (Luftman, 2005). The IT and business alignment aspect as well as the IT strategic planning remain in the top ten concerns of the CIOs and the IT executives in a period over twenty years (Rockart et al., 1982; Luftman, 2005). Some can argue that this consistency of results contradicts the evolving characteristic of the CIO role. Nevertheless, the fact that CIOs are still concerned with the same issues illustrates that those issues are not resolved. CIOs have not found the patterns to overcome them. In addition, the dynamic and competitive business environment, together with the technological development, requires a continuous alert and monitoring facility from the CIO point of view in order to face the business needs.

A set of six roles emerged by a study about the CIO role effectiveness (Smaltz et al., 2006). Although the study focused on the healthcare sector, the aspects emerged were similar to the ones that have been identified in the literature up to now. According to an exploratory factor analysis (Smaltz et al., 2006) the six salient roles of the CIO were:

- ✓ business strategist
- ✓ relationship architect
- ✓ integrator
- ✓ IT educator
- ✓ utility provider and,
- ✓ information steward

More recently, an exploratory study revealed aspects of the CIO role and in addition how these aspects are institutionalised (Watts & Henderson, 2006). The aspects emerged in this study were: peer relation and networking, support, motivation to achieve, innovation, reality checking and promoting credibility. This study also quotes CIOs activities that institutionalise the aforementioned role aspects. For example, interviewed CIOs have created or altered job positions to those that require networking behaviour, in order to achieve peer relations and networking. In addition, they demonstrate technological research and environmental scanning to introduce innovation within their organisations. However, those activities are not in their majority referring to the CIO role itself but, in many cases, to the way CIOs manage the IT department and their subordinates.

A concluding remark that can be made for the last ten years of the CIO role is that more qualitative studies attempted to investigate not only what the aspects of the CIO role are, but also how these aspects are instantiated within an organisational context. In other words, researchers were interested in how CIOs contribute to their organisations. A summary of the key characteristics identified in the literature during 2000s are shown in Table 3.

Looking at the evolution of the CIO role the last ten years, we can examine in what extent the previous role aspects have changed and what the newly appeared characteristics are during this decade. Regarding the managerial responsibilities (group [1]), it can be argued that business knowledge is required more than before by the CIOs to accomplish their role as managers. Also, they extend their abilities to issues such as change management and they try to perform business change. The internal communication role aspect (group [2]) requires team building and collaboration, while influencing and negotiating are skills that CIOs begin to have. The importance of competitive advantage through IS systems (group [3]) is shown through the development of an IT architecture covering the entire organisation and the focus on metrics and standards that measure its

effectiveness. Regarding the CIO role aspect of two-way alignment (group [4]), the linkage between IT function and corporate strategy is getting stronger.

Author	Year	Aspects investigated	Group
Buehler	2000	executive leadership and personnel supporting	[1]
		implement an efficient and effective IT-paradigm	[3]
		support organisation's mission statement	[4]
		realise cost avoidance or resource saving	[6]
Enns et al.	2000	use of personal appeal	[2]
Gottschalk	2002	entrepreneur (plan and implement change)	[1]
Kishore	2002	leadership in every level as more important than technology	[1]
Haselkorn	2003	technical communication	[4]
		team-building	[2]
		focus on strategic goals	[4]
		creative use of information tools	[6]
Reich and Nelson	2003	move even closer towards the strategic centre of the company	[4]
		require increased business knowledge	[1]
		improve ability to influence and negotiate	[2]
		renew focus on standardised architectures, metrics and value creation	[3]
Weiss and Anderson	2003	risks managers who must understand, communicate and share risks	[1],[2]
		quickly read complex environments	[5]
		change agents who must act collaboratively	[1]
Feld and Stoddard	2004	a long-term IT renewal plan linked to corporate strategy	[4]
		a simplified, unifying corporate technology platform	[6]
		a highly functional, performance-oriented IT organisation	[1]
Westerman and Weill	2004	operations	[1]
		application development	[3]
		IT strategy	[1]
		infrastructure and architecture	[3]
Smaltz et al.	2006	business strategist	[4]
		relationship architect	[2],[5]
		integrator	[6]
		IT educator	[2]
		utility provider	[3]
		information steward	[7]
Watts and Henderson	2006	peer relations and networking	[2],[5]
		support	[6]
		motivation to achieve	[4]
		innovation	[6]
		reality-checking	[5]
		promoting credibility	[3]

Table 3: The CIO role aspects of the 2000s

The CIOs participate in the business strategy and support the organisation's mission statement. The last role aspect from the previous decades, the external environment (group [5]), is still related to the partnership and networking skills. However, as a role aspect is not limited on scanning, it also involves the complex competitive environment and the quick responses by the CIOs to check the opportunities for the organisation.

It can be argued that during the last decade, the CIO role also includes two new aspects. The first one is innovation (group [6]) and the second is information management (group [7]). Innovation as a CIO role aspect is expressed through cost reduction and innovative use of the information resources. At the same time, emphasis is given on the management of the information as a strategic resource and the CIO role to integrate and use those resources for value creation.

In addition to the role aspects identified from the literature, it is useful to discuss the major changes in the technological landscape during the 2000s and reflect on the possible effects of major disruptive technologies on the CIO role aspects.

From the literature, we can identify three major technologies that were the highlight during the 2000s, namely, Enterprise Resource Planning technologies, the evolution of web 2.0 applications and the rapid expansion of mobile technologies as shown in Figure 3 (Carlson et al., 1996). During the early years of 2000s, ERP technologies became the de-facto standard for enterprise IT architectures and a large number of organisations went through the sometimes painful, route of redesigning business structures and processes to accommodate these technologies. Despite the often high costs, these technologies are capable of delivering high return values. At the same time, the web revolution continued with the appearance of semantic web technologies and applications (collectively called web 2.0) that gave rise to areas such as social networking and collaboration tools as well as a wealth of other applications that demonstrate the increased value of the rich interaction with the web content. Finally, mobile technologies including smart phones, laptops, tablets and other net-aware devices gave rise to the need for richer mobile content that moves beyond the “textual” content of the previous decade but also opportunities for increased interaction with users. On the basis of these technologies, CIOs were asked but also had the opportunity to contribute further to the innovation processes of their organisation which were “IT-enabled”. This related both to the internal environment of the organisation, primarily through the use of ERP technologies but also increasingly through the use of web and mobile technologies. The use of ERP technologies gave organisations the opportunity to reconsider the way processes were carried out and structures were defined and to take advantage of the restructuring opportunities to improve performance and minimise costs. At the same time, the semantic web and mobile technologies gave CIOs the opportunity to further innovate by bringing the customer closer to the organisation and often, including him/her as part of the actual process in a co-creation/co-production context. The same applied to the suppliers and other external entities that organisations interact with. Furthermore, on the basis of all these, the information management requirements became more visible and thus more important, for organisations to address. The role of the CIO in managing information flows from source to destination and transforming the information in ways that its value can be immediate acted up on, became the subject matter and focus of many of the studies found in the literature. This is probably the single most important issue that all these technologies imposed on the CIO role and it is the main subject of two of the latest studies on the CIO role that are discussed in detail in the next section.

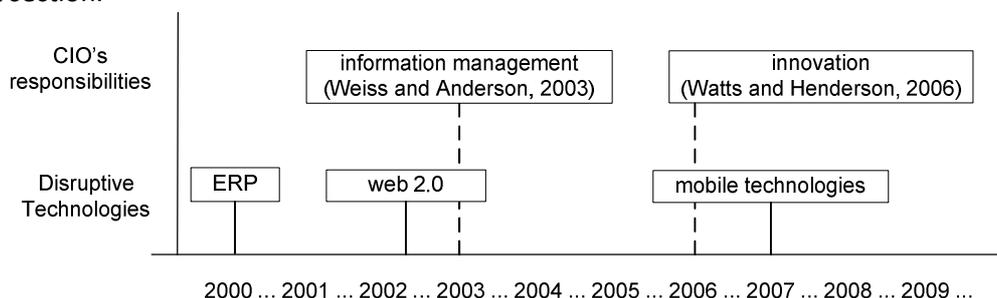


Figure 3: Disruptive technologies and CIO role aspects during 2000s

6. The CIO key themes and challenges

The previous analysis shows how the Chief Information Officer role evolved the last thirty years in relation to its responsibilities and to the technology in the internal and external environment of the organisations. In this context, we grouped those responsibilities in order to identify the key themes

and challenges of the CIO and examine how the evolution affected particular aspects of the role. Those challenges are as follows:

Managerial responsibilities

The managerial responsibilities of the CIO role are the first challenge that needs attention. The transformation of the role from a technician to a manager and then to an executive shows the shift of the role from functional responsibilities to more strategic ones.

Two-way alignment

This aspect refers to the CIO responsibility to align the business operations and the IT function. The two-way alignment appeared in the second decade and it relates to the strategic position of the CIO role within the organisation.

Internal communication

It could be argued that the internal communication aspect is overlapped or is part of the managerial responsibilities of the CIO role. However, internal communication is examined as a separate aspect based on its importance to the CIO role. The internal communication responsibilities involved into relationships building within the organisation and as a result, CIOs need to develop this aspect of their role in order to communicate and in some cases educate their colleagues on the IT function. In addition, internal communication is a twofold aspect. On the one hand, it relates to the aforementioned skills and capabilities of the CIO as a person and, on the other hand, it refers to the IT-enabled communication and collaboration environment that the CIO is called to design, develop and maintain within the organisation.

External environment

The more the IT function is expanded in the businesses and through outsourcing, the role of the CIO also expands to the external environment. CIOs have to be aware of what the competition is doing in terms of IT, best practices in business processes and how technology helped organisation to develop. These responsibilities enhance the CIOs with a more complete picture of the marketplace and as such they help CIOs to educate and influence the other executives. In that context, the external environment aspect of the CIO role is an essential part of the role.

Competitive advantage

The CIOs role aspect of bringing competitive advantage to the organisation evolved the last thirty years. Initially, the source for competitive advantage was the technology. Later, the focus was on the ISs that support the business processes. In addition, emphasis was given to the performance of those systems and how they could bring competitive advantage through efficient use. At last, great importance was given to the IT architecture and infrastructure and thus, the source for competitive advantage was the development of enterprise applications with cross-functional implementation.

Innovation

A CIO role aspect that emerged the last ten years was that of innovation. CIOs need to be innovative and at the same time to reduce costs where is possible. They also need to

integrate business processes and applications in order to help their organisation to differentiate from the competitors.

Information management

Although it can be argued that Information management is the overall CIO goal, it appears as separate role aspect. This aspect perceives information as a strategic resource for the organisation. It involves operations such as collection, manipulation and distribution of information among the organisation.

7. Current CIO role models

This section reviews some of the current CIO role models and examines in what extent models such as these are adequate and well defined in describing the CIO job and encapsulate the CIO role aspects and responsibilities that appeared the last thirty years. Two CIO role models are selected for that purpose. The first CIO role model by Maes and De Vries (Maes & De Vries, 2008) is chosen as it covers the theoretical perspective of the role. It defines the CIO based on the Information Management theory, and in that sense, it is scientifically complete and valid. The second role model proposed by IBM (IBM, 2009) is based on a study about the role aspects and activities of CIOs worldwide. The value of this model lies on its large sample covering a wide range of countries and sectors.

Apart from the following representative CIO role models, there is a number of similar studies that attempt to define a model based on similar research on specific sectors or geographical areas. For example, studies were based on healthcare sector (Smaltz et al., 2006) or on a particular country (Gottschalk, 2002) and for this reason they were excluded as representative models. In addition, the purpose of the present study was not to test the validity of current models.

Previous research aimed to model the CIO role aspects in a conceptual framework that contains the salient aspects of the IT executive. Educational experience exposed that practitioners require a holistic framework that demonstrates the various aspects of the position in an understandable way to the CIOs (Maes & De Vries, 2008). The majority of the CIO role activities deal with issues that are rarely IS oriented, thus the conceptual framework needs to take under consideration a multi-disciplinary approach and integrate various aspects that non-IT people would comprehend. In this vain, the proposed model was based on the integrative framework for Information Management (Maes, 2007). As shown in Figure 4, the framework demonstrates the Information Management within the organisation as an integrative and balanced operation that considers two dimensions. The first dimension (vertical) concerns the strategic, the structural and the operational level of information related issues, whilst the second (horizontal dimension) demonstrates the issues related to business, information/communication and technology.

In this context, the areas of concern and responsibility of the CIO are spread to these three levels of hierarchy and to the whole spectrum of Information Management. In other words, the CIO role includes strategic, structural and operational information-related issues (vertical dimension) and relates the external and internal information and communication processes and their supporting technology to general business aspects (horizontal dimension).

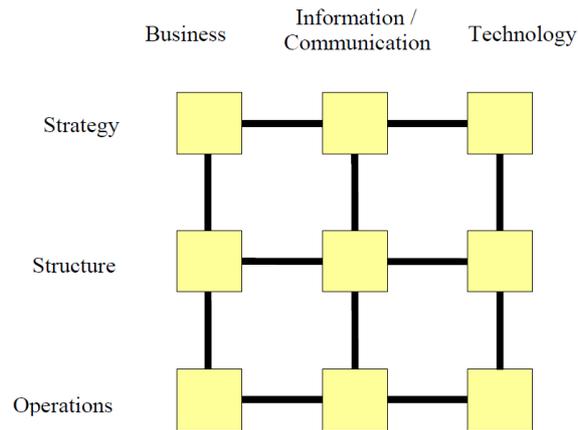


Figure 4: The IM integrative framework (Maes, 2007)

According to the above framework, the CIO operates as an orchestrator of the informational activities that take place within the organisation boundaries and as an equilibrist between information and inspiration (Maes & De Vries, 2008). In particular, the CIO post includes the following roles:

- ✓ information strategist
- ✓ co-creator/advisor business strategy
- ✓ IT portfolio manager
- ✓ enterprise architect
- ✓ business advisor and,
- ✓ trend watcher.

The previous conceptual framework is well defined for the Information Management concept in the organisational context. However, its implementation as a role model for the CIO post is open to various interpretations. The first point that can be made is that, as the framework is based on the internal Information Management function of the organisation, the relationship of the CIO with the external environment is overlooked. There are some CIO roles that imply the external environment awareness (such as the trend watcher), yet the importance of the changing environment is not clearly depicted. Examining in more detail the roles of the CIO as they are explained in the role model, it can be argued that they are abstracted in a level that they are easily overlapped. For example, the co-creator/advisor business strategy role represents the co-creative role of the CIO to the business strategy along with the other members of the board (Maes, 2007). At the same time, the business advisor role refers to the peer relationships of the CIO with the business unit managers (Maes, 2007). These two roles do not explicitly describe the position of the CIO in an understandable way as the authors suggested. Perhaps the misleading concept begins from the distinction between business and business strategy. With the assumption that the former concept is related with the operations while the second with the long term planning of the organisation, the problem of understanding is resolved partially. This interpretation leads to the confusion between the business advisor and the enterprise architect one. As a result, the proposed framework is based on a well defined Information Management context within the organisation, yet it is limited in terms of the wide range of the CIO role aspects while it is not clear in defining the different role aspects.

A global Chief Information Officer study by IBM was conducted during 2009 and gave insights about the aspects and the activities of CIOs worldwide (IBM, 2009). The sample of the study was adequate enough, with more than 2,500 CIOs participated from 78 different countries and 19 industries. The outcome of this study was three pairs of roles or aspects as they are shown in Figure 5. These twofold aspects are innovation, Return on Investment (ROI) and business impact. The aspects are characterised as twofold because they are spread between two opposed sub-roles. So, innovation

for the CIOs means to be insightful visionaries but also capable pragmatists. In other words, CIOs have to be creative thinkers and introduce cutting-edge technology initiatives, yet they have to face reality, advance the productivity of current IT solutions and build a vigorous innovation foundation (IBM, 2009).

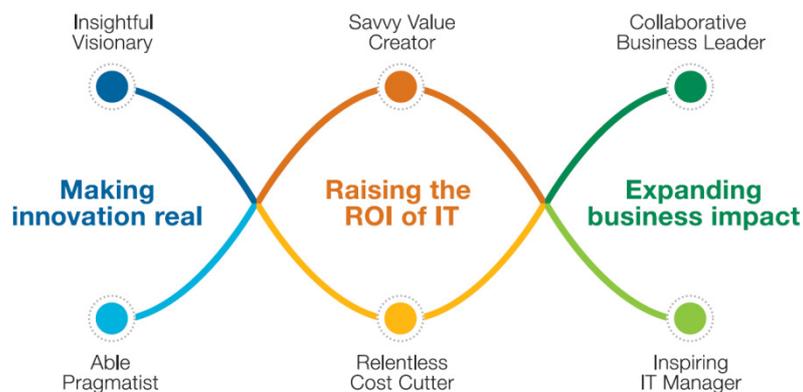


Figure 5: The CIOs' three primary goals (IBM, 2009)

The second twofold CIO role aspect is about ROI. According to the outcome of this IBM study, CIOs both create value and cut costs. They create value through better customer services and understanding of their needs. At the same time, CIOs are seeking ways and transform procedures in order to reduce costs through automation, centralisation and standardisation (IBM, 2009).

Similarly, in their role to expand the business impact, CIOs have to balance between collaboration and inspiration (IBM, 2009). Collaboration helps partnership with other executives. CIOs are called to build better business models and perform cultural shift with their colleagues. This part of the role entails that the business impact of the IT is not only a job for the IT department and its leader. It is an issue for all the CxOs and the CIOs as such, that collaboration will assist them in the process of business impact expansion. On the other hand, CIOs relationship with the IT managers and subordinates is still important and vital. Hence, within the IT department CIO's ability to motivate and inspire IT managers force excellent IT centres and foster IT expertise to extract and preserve critical business data.

The previously described role model of the CIOs gives useful insights from the industrial perspective. In addition, the sample size and the variation of the countries involved in this study add value to it. Nevertheless, a more detailed view of the framework is conflicting in terms of activities and tasks CIOs perform to achieve the highest level roles. According to the framework, one of the key initiatives to make innovation real is to extend CIO influence. That can be achieved, from the CIO perspective, through helping to define the overall business vision and strategy and take on other non-technology leadership roles (IBM, 2009). Those activities are more related with the business impact expansion and the participation of the CIO with the development of the business strategy. In addition, according to the role model, making innovation real is achieved through better partnering and collaboration technologies activities, that are mentioned again as the means to inspire the IT managers and ultimately expand the business impact. This inconsistent structure does not help in formalising a well-defined CIO role model that could be easily understood by CIOs and other executives.

8. Conclusions

This study investigated the Chief Information Officer role the three decades of its existence. The CIO role evolution in relation to the disruptive technologies that changed the industrial landscape reviewed in the previous pages. Starting with a technical orientation, the executive responsible for the information resources of the organisation changed to a more manager-oriented director

(Rockart, 1982). Further than that, as information and technology became vital resources in the business environment, CIO gained a strategic position within the organisations. Not only in industry, but also in public sector and non-profit institutions, the CIO role is indispensable and a number of operational and strategic moves rely upon its contribution to the organisation growth. The review of role aspects and responsibilities indicated the CIO key themes and challenges, which include managerial responsibilities, two-way alignment, internal communication, external environment, bring competitive advantage, innovation and information management.

In addition, two current CIO role models by Maes and De Vries (2008) and IBM (2009) reviewed. It is argued that those CIO role models are not adequate for specific reasons and there is a gap of knowledge that the present study fits in. Despite the thirty years life of the CIO, the role of this senior executive is not well defined and research is needed to investigate its responsibilities and activities (Karahanna & Watson, 2006).

For that reason, a conceptual framework is proposed for researching the CIO role. This conceptual framework is based on the literature review, the current models and the key themes and challenges the CIOs have faced the last thirty years. It consists of four salient role aspects: business strategy, innovation and competitive advantage, relationships building and external environment. The proposed conceptual framework could be the corner stone for future research on the Chief Information Officer role.

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