How Business Strategy and Changes to Business Strategy Impact the Role and the Tasks of CIOs: An Evolutionary Model

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Abstract

We investigate the determinants of CIOs' organizational role and tasks. We first review previous studies, which we classify as either evolutionary or CIO role studies. We consider them to be characteristic to the usage of certain technologies or certain periods of times. We modify Leavitt's well-known model to describe factors that shape the role and the tasks of CIOs over time, industries and technologies. We validate the model from interviews with 36 CIOs within six industries covering the time period from 1960s to present times. We also show that the model can be used to categorize prior research findings. We then use the model to describe how business strategy impacts CIOs' role and tasks and how changes in business strategy influence CIOs and vice versa. We discovered that the modified Leavitt model is a useful description of factors that both define CIOs' role and tasks at any particular time in any specific organization, and show how those tasks change.

1. Introduction

During the past five decades, the business criticality of information technology (IT) and its management has increased as organizational activities have become increasingly IT dependent [14, 28]. The chief information officer (CIO) of the organization is one of the key persons responsible for the deployment and management of IT [7, 50]. It is logical to reason that the growth of IT usage will also impact what CIOs do. Indeed, previous research has shown that the number and variety of issues that CIOs deal with have increased over the years as reported in [2, 11, 19, 25, 45]. Changes to the perceived focus of CIOs' role and tasks have also been reported [1, 10, 12, 14, 32, 33, 52].

Consequently, recommendations for CIO competences such as the CIO Council Clinger-Cohen list [17, 35], have been modified several times. Research on what CIOs do [2, 13, 20, 47 48, 49, 59], what kind of professional and personal skills and competences they (should) have [8, 11, 35, 46, 55] and whether the CIO should be one of the senior executives of his/her organization or not [7, 28, 34, 50, 51, 53] impact these recommendations. Earlier studies have also investigated such issues as: are there differences between corporate and public sector CIOs [18] or between CIOs in developed and developing economies [24]? Researchers have cumulatively not only attached various attributes to CIOs and their competences but also to their tasks and organizational role. As a myriad of issues appear to impact the tasks and the role of CIOs, the motivation for this research arises from questions: *Are there other factors which define CIOs' role and tasks in addition to technology? And, if so, what factors are able to define the role and tasks of CIOs and variations in them across industries, technologies, organizations and other issues that evolve over time*? We define role as the organizational status and influential possibilities of the status holder within an organization. When the CIO term emerged, the role was described as a strategic and business-oriented executive with good understanding of technology [5]. For tasks we refer to work content, that is, what a CIO actually does in his/her profession.

Changes in what CIOs do appear to be related to advancements in technologies and characterized by the ever-increasing deployment of IT. However, evolution in organizational and strategy thinking as well as (IT) governance and managerial practices also appear to impact CIOs. Several models to determine the role and tasks of CIOs have been proposed. In general, they appear to either suggest alternative roles for a CIO or describe the changes and evolution of issues that CIOs need to consider. Previous studies have suggested that CIOs could have one [11], two [9], three [53], four [13, 16, 57], five [30, 47] or six [27] alternative roles. We call these, "CIO role studies". Other studies have described evolutions and growth in IT deployment and the impact of this on what CIOs do [3, 15, 29, 33, 41, 48, 50, 52]. We call these, "evolutionary studies".

Against this background, we suggest that it is legitimate to ask if we have really been able to model how the role and tasks of CIOs are determined in general - and within each organization in particular. In this article we focus in addition to this question especially on how changes in business strategy influence the role and tasks of CIOs. Since the role and tasks of a CIO are organizational we decided to use a well-recognized organizational development model as our framework and selected Leavitt's framework for that purpose. In summary, our article aims to answer the following two related research questions:

"*Could Leavitt's model serve as a useful description of the factors that shape a CIO's role and tasks within an organization?*" and *"Could Leavitt's model be able to describe changes to a CIO's role and tasks within an organization following a change in the organization's business strategy?"*

To answer our research questions we reviewed previous studies and interviewed 36 CIOs from six industries. In the next chapter we take a look at previous CIO studies. In chapter three we discuss the methodology of the interviews and present the findings of our research in chapter four. We end the article with conclusions and discussion.

2. Theoretical background

2.1. CIO research: evolutionary and role studies

Electronic data processing (EDP) manager, EDP director and IT director were some of the titles used for the head of the IT function prior to the CIO term emerging some 30 years ago [5, 54]. The use of the CIO term has raised the status of the IT function head to the level of other "C-level" executives [49]. Still, several interpretations about the role and tasks of the CIOs exist. We reviewed close to 50 articles from the beginning of the 1980s to recent times in order to understand how the role and tasks of CIOs have been described in prior research.

Researchers have studied changes in CIOs' role and tasks from variety of perspectives, which range from technological to organizational and from institutional to personal. Consequently, many factors have been proposed to act as the underlying explanatory reasons for changes in them. What we call evolutionary studies refer to the characteristics of IT and especially to the changes in IT over time, typically new emerging technologies [e.g. 33]. There is a strong consensus among these researchers that the CIO term emerged gradually and that CIOs' roles and tasks evolve when the volume, depth and maturity of IT usage increases. During the 1980s CIO research focused on how to deploy IT in organizations and what the strategic nature of IT means [6, 7, 19, 21, 32, 50, 54, 59]. During the 1990s, CIOs' competences and personal skills were added to issues investigated [8, 55]. Other new issues included CIOs' capabilities to manage the complexity of technology [2, 51] and to establish co-operation between business and IT [8, 52, 53]. During the 2000s the governance of IT, enterprise architecture and the ability of IT to support innovations were added [1, 14, 22, 26, 27, 48, 58]. Fuelled by so-called business IT including digitalization of business and strategy, the data explosion, the Internet of things and other developments, many issues related to what CIOs do have re-emerged onto the research agenda. A CIO's participation in an organization's transformation to an information asset and capabilities management as well as into the creation of IT and digitalization understanding among business executives are seen as issues that place new demands on CIOs [4, 13, 30, 34, 37, 46, 47, 49].

What we call CIO role studies typically describe how IT deployment and CIO work is related [e.g. 13, 47], or to what tasks CIOs use their time for in organizations [e.g. 57]. The number of proposed roles ranges from one to six. Table 1 presents a summary of CIO role studies.

It appears to us that CIO role(s) and tasks proposed in studies conducted in the 80s, 90s or early 00s no longer describe what CIOs do today. For example, in the 1980s, IT technological understanding focused on mainframe and minicomputer environments and on internal software development. Today, the range of required technological understanding is significantly wider including the Internet, web services, enterprise architecture, mobile technologies, social media, big data, cloud services, robotics to name but a few. Similarly, during the 1980s, strategic IT thinking focused on value chains, IT's competitive advantage and business-IT relations. Globalization, value and business networks, digital strategy, business models, IT-enabled business transformations, while typical for today, were not on CIOs' agendas then. We feel that the descriptive validity of both the evolutionary and the CIO role studies are limited to certain types of organizations or to the deployment of IT in a specific way or for specific purposes, and/or at a specific time. Cumulatively, they reflect the continuously growing deployment of IT in organizational activities and the related increase in the number of issues that CIOs need to address and manage. It is likely that the developments of IT, strategic management thinking as well as organizational behavior, skills and processes have made and will make these descriptions and/or models outdated. Changes in the priorities of an organization, which reflect evolutions in its environment, may change the focus of what the CIO does in a short time, even several times.

From this, we draw the following two conclusions: Firstly, the concrete everyday tasks of CIOs, which reflect both changes in IT technological understanding as well as in strategy and business orientation, appear to evolve over time and will most likely continue to do so. Secondly, the role of the CIO has remained unchanged. The CIO appears to have acted and still act as the strategy-oriented executive whose specialty is to understand how IT and digital data can be deployed in a value-creating way within the various activities of the organization. We ask if it possible to find a model, which describes factors that determine CIOs' role and tasks. This would include: over time; across organizations and industries; changing IT, technological and organizational environments; and evolving strategic management thinking and practices. We believe that such an evolutionary model offers both researchers and practitioners a robust means to define factors that shape the work of CIOs in general and within a specific organization.

2.2. The modified Leavitt model

The role and the tasks of a CIO are conducted in an organizational context. Changes, in what the CIO does, happen in order to improve the organization's performance.

Table 1. CIO role studies and CIO role types proposed in them

	Researcher(s)	Research approach	CIO Role Types
One CIO Type	Brown (1993) [11]	Integrate the organizational and individual perspectives as well as the CIO partnership role.	General manager
Two CIO Types	Broadbent and Kitzis (2005) [9]	Recognize different organizations, which require different behavior and actions from CIOs.	Demand-side leadership for shaping and managing IT expectations, supply-side leadership for delivering cost-effective IT services
Three CIO Types	Stephens et al. (1992) [53]	Investigate how MIS managers and CIOs use their work time within IT and outside of IT and how close those activities are to CEOs' work.	CIO in decisional role, MIS manager, CIO interacting outside of the IT function
Four CIO Types	Chun and Mooney (2009) [16]	Determine CIO role types on the basis of an organization's IT strategy and on the basis of how IT infrastructure is managed (divergent or orchestrated)	Innovator & Creator, Opportunity Seeker, Landscape Cultivator, Triage Nurse & Fire Fighter, Innovator & Creator, Landscape Cultivator, Opportunity Seeker, Landscape Cultivator
	Carter et al. (2011) [13]	Distinguish three traditional IT management roles: Decisional, Informational and Interpersonal, with a new business technology role – strategist – added	Interpersonal CIO/ Leader, Informational CIO/Spokesperson & Monitor, Interpersonal CIO/Liaison, Strategist
	Weil and Woerner (2013) [57]	Determine CIO roles in digital economy by investigating how they spend time in activities, which are classified into four task categories	Embedded CIO, ICT services CIO, External customers CIO, Enterprise processes CIO
Five CIO Types	Peppard et al. (2011) [47]	Evolutionary model of CIOs role: "CEO's need to understand what type of CIO is appropriate at a particular point in the organization's journey"	Utility IT Director, Agility CIO, Innovator CIO, Evangelist CIO, Facilitator CIO
	Guillemette and Pare (2012) [30]	Describe the contribution of the IT function to an organization by applying a typology of five ideal contributing profiles.	Partner, Systems provider, Architecture builder, Technological leader, Project Coordinator
Six CIO Types	Gottschalk (2000) [27]	Analyze how the characteristics of an individual, position and organization predict the CIO role in an organization.	(Coach) Product developer, Technology provocateur, Chief operative strategist, Chief architect, Technology provocateur, Change leader

To facilitate this, the CIO needs to respond to continuous changes in business environment, technologies and other factors. Their impact appears through customer, user and other stakeholder expectations and demands. The literature reviewed suggests that evolution in CIOs' role and tasks are driven by identifiable factors. As the result of this reasoning, we decided to seek the theoretical basis of our research from organizational diagnostic models since those models capture organizational evolution. Organizational diagnosis means that the organization's current level of functioning and activities are assessed in order to design appropriate efficiency and effectiveness improvements, i.e. interventions, such as better deployment of a specific technology or IT management improvements. Evolutionary IS theories, for example [36], [40] or [60], are alternatives to evolutionary organizational theories. We chose the latter due to the organizational nature of CIOs' role and tasks.

From alternative models we selected Leavitt's model [39], because it is widely recognized and has been used in several previous IS studies [e.g. 42, 44, 56, 61] in novel, and sometimes critical ways. We hope that our research will add to that tradition. Leavitt's model identifies four interrelated factors, which describe organizational development. They are structure, task, people and technology. Leavitt's model was presented in 1965. After that time, new constructs such as business models and corporate/IT governance have become established. Because Leavitt's factors articulate the basis of factor interrelations but lack the contemporary constructs, we modified the wording of some factors in the model. Contemporary IT consists of technology, IT services and information. We enhanced the wording of the technology factor to reflect

this. For the same reason we modified structure into strategy, business model and governance; task into tasks and processes. Please, note that we regard these modifications as updates of the model that reflect contemporary constructs, not as changes to the logic of the model. The model with our modifications is shown as Figure 1. To summarize, we propose that the factors of the modified Leavitt's model define CIOs' role and tasks.
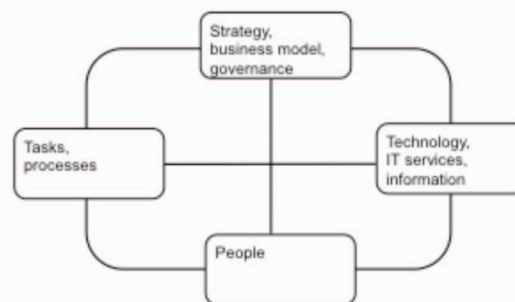
Figure 1 The modified Leavitt model

We also propose that the factors of Leavitt's model can be used to understand, describe and/or classify the findings of both evolutionary and CIO role studies. For example, Weill and Woerner [57] proposed four roles for CIOs on the basis of how CIOs allocate their time between various tasks. Weill and Woerner, similar to other role model studies, suggest that one of the alternative roles best describes the role and the tasks of any individual CIO. Their four alternative roles are embedded, IT services, external people and enterprise process CIO roles. For

example, the strategy, business model and governance factor appears as the main determinant for the embedded CIO's role. That is, the embedded CIO allocates biggest part of his/her time to tasks, which are related to this factor. Similarly, as an example of evolutionary studies, Ross and Feeny [52] described changes in technology and how those had impacted strategy, people (CIOs) and processes. Interestingly, in their article, the factors of the Leavitt model are mentioned explicitly. Although we have also classified other previous CIO studies with the Leavitt model, reporting the full results of these classifications in details falls outside the scope of this article.

2.3. Business strategy changes and their impacts

Most importantly for this article, Leavitt's model shows how business strategy and changes to business strategy determine changes in the role and tasks of CIOs in relation to other model factors. The diamond shape of the model means that if one of the factors of the model changes, this will affect all other factors of the model and they will also change. Secondly, all relations between the factors of the model are bidirectional. Thus, a change in a business strategy influences all the other factors and changes in other factors will influence business strategy. Our conclusion and proposition is that a CIO most likely has several concrete tasks at any given time, which reflect the combined impacts by the factors of the model. All of them, as well as their combinations evolve in relation to the evolutions of organizational context such as business objectives, process improvements, significant customer requirements or new technology implementations. The role and tasks of the CIO may appear different to the various stakeholders of the organization, such as the business units of an organization. Similarly, the allocation of the CIO's time to various tasks may vary from day to day reflecting the needs of the current organizational context. Yet we propose that the combinations of the tasks and the role are not random but are determined by the combinations of the factors depicted by the Leavitt's model. In other words, the factors of the Leavitt model define the boundaries for the CIOs' role and tasks.

We found surprisingly little literature on how changes in business strategy impact the role and tasks of a CIO and vice versa. For example, this topic was largely missing from the CIO literature reviewed above, whereas the bidirectional connection between business strategy and IT is a much-investigated topic [e.g. 1, 20, 23. 31, 32, 40, 61]. Several authors have discovered that for organizations, IT has offered opportunities to redefine strategies, to increase revenue streams and profits. In addition to the transformation of existing markets into electronic markets, IT development has also helped to create totally new markets such as digital content [e.g. 38]. The deployment of technology in alignment to business strategy enables an enterprise to differentiate its operations from competitors [e.g. 31, 32]. Consequently, CIOs need to consider a wide

set of issues as they also act as the chief IT strategists and cooperate with all other functions of their organizations. While doing this they meet constantly evolving expectations. Expectations are in constant flux, since they reflect the information needs of the organization and the technologies used in its systems [e.g. 28].

Our proposition is that the factors of the Leavitt's model capture the impact of business strategy changes to CIOs' role and tasks in a twofold way. Firstly, when the business strategy of an organization changes that will enhance the role and the tasks of the CIO. In other words, the CIO needs to refocus her/his work to implement the new business strategy. Secondly, when new technologies emerge, users and the use of IT could change, or new IT-enabled processes could be implemented. The CIO should take them as an input to the business strategy work. In other words, the CIO needs to consider how the existing IT assets and new technologies/assets could be deployed to improve the business strategy of the organization and/or the implementation of the strategy. Leavitt's model suggests to the CIO what factors to consider in doing that.

3. Research methods: the CIO interviews

In order to understand how the role and tasks of CIOs are defined, we interviewed 36 CIOs from six industries, 31 during the years 2011 – 2013 and five before the year 2011. From these interviews we also sought answers to how changes in business strategy influence CIOs' role and tasks and vice versa. The industries studied are media, public sector organizations, finance, manufacturing, wholesale and retail sale commerce, and services. A summary of interviewees is shown in Table 2.

For collecting the empirical data we first selected the industries. The industries were chosen to represent the diversity of IT deployment and the CIO profession. We then listed the largest enterprises and CIOs of the enterprises based on our professional access to them. We used this opportunity to invite recognized CIOs with long CIO careers from the leading enterprises in their industries to interviews. Interviewees include group level and divisional, corporate and public sector as well as national and global level CIOs. We opted to interview several CIOs from one industry in order to remove possible organizational idiosyncrasies. The idea was also to collect data across several industries in order to find similarities between industries but also to understand whether the characteristics of specific industries impact how the CIOs of that industry perceive their role and tasks. Empirical data were collected with personal face-to-face interviews. We followed the methodological principles of semi-structured interviews outlined by Yin [62] and expanded on by Myers and Newman [43]. With the interviews we tried to capture the historical evolution of each issue to the extent that the interviewee had personal experience. Questions were formulated in two ways; how was the issue managed in the past and currently.

Table 2. Summary of interviews and interviewees (note: me = Millions of Euros)

Industry: CIO#-CIO# n (per industry)	Dates of interviews	Time period covered	Average Years as CIO	Gender	Age at the time of the interview	Size of the company (revenue)
Media: CIO1-CIO5 (n=5)	03/11- 08/12	1997-2012	8	3 Males 2 Females	1 age 30-39 4 age 50-59	1 > 1000 me 3 100–1000 me 1 < 100 me
Public sector: CIO6-CIO10 (n=5)	10/11-09/12	1984-2012	14.8	5 Males 0 Females	5 Age 50-59	2 > 1000 me 2 100–1000 me 1 < 100 me
Finance: CIO11-CIO14 (n=4)	11/11-06/13	1987-2012	10.75	4 Males 0 Females	1 age 40-49 3 age 50-59	2 > 1000 me 2 100–1000 me
Manufacturing: CIO15-CIO24 (n=10)	03/09-11/13	1976-2012	10.55	9 Males/ 1 Female	4 age 40-49 4 age 50-59 2 age 60>	10 > 1000 me
Commerce: CIO25-CIO32 (n=8)	10/06-06/13	1956-2012	14.63	8 Males/ 0 Females	2 age 40-49 4 age 50-59 2 age 60>	4 > 1000 me 4 100–1000 me
Services: CIO33-CIO36 (n=4)	08/07-07/12	1991-2012	14.75	3 Males/ 1 Female	1 age 30-39 2 age 40-49 1 age 50-59	3 > 1000 me 1 N/A

The final interview questionnaire evolved over time. The first five interviews were used to learn what kinds of survey items were useful for our study. These five interviews constitute our pre-study. Therefore, the first interviews were conducted with an open question formulation. Interviewees were asked to compare the past and the present for each topic. On the basis of the experiences of the first five interviews and to avoid situations where interviewees told long and as such interesting and amusing narratives sometimes for several hours, we limited the interview time to approximately two hours. In this way we refined the survey instrument to a semi-structured interview questionnaire with 51 survey items. Interviewees were still asked to compare the past and the present for each item. In addition to background and operationalized variables of the Leavitt model, there were also other survey items. For example, interviewees were asked to describe the leadership style of their organization, how the IT organization was evaluated and what they considered as their challenges in their CIO position at the beginning of their CIO career, currently and looking into the future.

During the interviews we used a laptop, projector and screen while we entered their responses *verbatim*. Thus, an interviewee could see what was written in real time and was able to correct possible misunderstandings. This technique shortened answers and the interviewees considered more carefully what s/he said. The adopted approach helped the interviews to focus on the survey items. We also used a digital recorder and recorded the discussion (interviewee permission was of course sought and obtained). Recordings were used as backups and complete transcripts produced after the interviews. Each interviewee, except the first five, was given the opportunity to modify the transcript of their interview and twelve of them used this opportunity.

We compiled the CIO research literature reviewed above with a systematic literature review approach. Key words and their combinations were used to extract articles from research publication databases.

4. Findings

As Table 2 shows, the CIO experience of six interviewees was less than five years whereas five had over twenty years of experience, with the average of 12.25 years. Four interviewees (11.1%) were females. According to previous studies, a typical CIO is highly educated [e.g. 11, 50]. In contrast to that, twelve (33%) of our interviewees did not have a university degree. However, the remaining twenty-four interviewees had cumulatively thirty-one university degrees including four doctoral degrees. Three interviewees had retired and three more planned to retire in the near future. The status of 72.2 % (26) interviewees had changed, whereas the enterprise and the CIO status had remained unchanged only for ten (27.8%). This finding is in line with [47]. Two interviewees are now deceased and four others have retired.

Those who had long history in IT explained that the main reason to acquire the first computers was to reduce accounting-related manual work. At that time it was logical that the head of the IT reported to the CFO. Even today, thirteen of the interviewees reported to CFOs, whereas eleven reported to CEOs and twelve to other C-level executives. Only a handful of them had been either executive committee or board members at the beginning of their CIO careers or were invited to participate on executive committee and/or to business unit steering committee meetings. Almost all had experienced restructuring of their IT organizations during the time they had acted as the CIO, but the reasons varied. Some restructurings were related to business strategy changes and some to mergers and acquisitions (M&A).

We analyzed the interviews by counting how many similar answers we received to each survey item. More than half (24) of the interviewees described their current

role to be something different from a technology-oriented role, which it had often been. The common feature is that the CIO role was described as a business executive within the industry of the organization. For example, CIO29 said, *"our executive committee only consists of book sellers, who have different areas of responsibility, such as IT."* The concrete level roles and tasks of some CIOs transcended IT and included logistics, business intelligence, purchasing or process development roles and tasks to name a few. All ten CIOs of the manufacturing industry worked in global or regional corporates and seven of them were partly or fully responsible for process development. CIO20 stated, *"there has been a clear demand for global processes and global IT among business leaders already for years."*

Although the business environment of the enterprises within an industry was similar, the tasks of CIOs differed. For example, CIO11 - CIO14 were from the finance industry. CIO11's main task had been to develop enterprise architecture and data security, whereas CIO12's focus was on off-shoring activities and application integration. CIO13 worked primarily on internationalization as the financial institution was involved in a M&A transaction. CIO14 worked to transform the business and support processes of his organization. It was a surprise to us that the industry of the organization shaped the tasks of the CIO only limitedly - if at all. Instead of that, each interviewee described her/his role and concrete tasks during the CIO career with unique terms. Organization specific combinations of business environment drivers, priorities and challenges; process and task characteristics and performance; the organization and competences of personnel, customers, other stakeholders as well as the history and experiences of technology usage made each interviewed CIO unique. Although there was significant variation in the stability of their work, all interviewees explained that their tasks, even their most important tasks, had changed frequently as the result of changes in the combinations of the above mentioned factors. This was the initial evidence to us that Leavitt's model could explain factors that shape the CIOs' work.

4.1. Leavitt's model and CIOs' roles and tasks

Next we classified the CIO interviews with the modified Leavitt model. Four researchers reviewed the fully transcribed interviews independently and classified the impact of each factor on a CIO's role and tasks into weak, mediocre or strong for each response. The interpretations were then compared and agreed if there was a difference. The four interpretations were fairly consistent. Out of 144 (4 x 36) values only sixteen (11%) were discussed and there were no weak – strong differences between the individual interpretations. The outcome of all classifications is shown in Table 3.

Not surprisingly, we found that the technology, IT services and information factor had the highest impact on the role and the tasks of the CIO, and on their work in general. Twenty-two CIOs expressed the view that technology strongly influences their work. The impact of the strategy, business model and governance factor was almost equally strong. Thus, business strategy and technology seem especially to drive CIOs' work. This is in line with another of our finding according to which most of the interviewed CIOs currently participate into their organization's strategy process similar to other executives. Almost all CIOs also participated in the meetings of their organization's steering group and/or had established IT steering groups to interact with relevant IT stakeholders. They also felt that business executives understand IT increasingly better as a consequence.

The impacts of the people as well as the task and processes factor were lower. Yet, as Table 3 indicates, people as well as tasks and processes are also significant determinants for the CIOs' work. The processes of an organization were not addressed directly by any of the 51 questions in our questionnaire. Yet thirty-three CIOs mentioned processes and thirteen explained that this impact is strong.

4.2. Business strategy and CIOs' roles and tasks

Cumulatively our interviewees mentioned several tasks when they described the impacts of the strategy, business model and governance factor on their work. We compiled these tasks into Table 4. In the design of Table 4, we applied the CIO role studies as a classification of tasks related to this factor. We added those tasks mentioned by the interviewees that were not present in the reviewed CIO role studies at the end of the table. We crafted similar tables for the three other factors of the Leavitt model. The reporting of them falls outside the scope of our article.

Table 3. Summary of findings classified with the modified Leavitt's model

	Strategy, business model, governance	People	Technology, ICT services, information	Tasks, processes
Weak effect	6	6	4	8
Mediocre effect	11	19	10	12
Strong effect	19	11	22	13
Total	36	36	36	33

Table 4. Summary of findings classified with the modified Leavitt model

Strategy, business model, governance: "Role" proposed in CIO role studies and/or task described by the 36 interviewed CIOs	Author of the CIO role study	Role and/or task referred by the interviewed CIO
CIO's formal resource allocation authority	Stephens et al. 1992 [53]	Not mentioned explicitly in interviews
CIO as chief operating strategist	Gottschalk 2000 [27]	Not mentioned explicitly in interviews
Opportunity seeker (drive strategy) Technology provocateur (embedding IT into the business strategy)	Chun and Mooney 2009 [16] Gottschalk 2000 [27]	CIO2, CIO3, CIO5, CIO10, CIO15 (Brand, challenge eBusiness, value chain)
CIO as product developer (helps define the company's place in the emerging digital economy) Innovator and creator (new revenue from new products etc.) – digitalization Innovator (IT enabled processes, innovative services, products) Business technology strategist (use technology as a tool to create competitive advantage)	Gottschalk 2000 [27] Chun and Mooney 2009 [16] Peppard et al. 2011 [47] Carter et al. 2011 [13]	CIO1, CIO2, CIO3, CIO4, CIO5, CIO7, CIO8, CIO13, CIO14, CIO16, CIO17, CIO18, CIO21, CIO22, CIO24, CIO25, CIO26, CIO28, CIO30, CIO31, CIO33, CIO35 (digitalization; products, services, innovations, …)
Decisional role activities (entrepreneur – resource allocator) Decisional role activities	Carter et al. 2011 [13] Stephens et al. 1992 [53]	CIO2, CIO4, CIO7, CIO35 (cost savings)
Embedded CIO (focus on strategy, business process execution, innovation).	Weill and Woerner 2013 [57]	CIO6, CIO8, CIO9, CIO10, CIO13, CIO14, CIO15, CIO16, CIO19, CIO20, CIO21, CIO22, CIO25, CIO28, CIO29, CIO36
Mergers and acquisitions, major internal structural changes in organization & ICT, alignment of global and local, group and business units		CIO1, CIO10, CIO11, CIO12, CIO13, CIO16, CIO18, CIO19, CIO22, CIO25, CIO27, CIO28, CIO32, CIO34
Customers or other stakeholders as the basis of business strategy with IT enablement		CIO7, CIO17, CIO26, CIO30, CIO36
Climate change, real-time economy and other global drivers		CIO19, CIO21, CIO33, CIO35
Managing technology challenges as a whole with a business strategy perspective		CIO3, CIO4, CIO12, CIO15, CIO21, CIO27, CIO32

An interviewee typically mentioned two or three concrete level business strategy related tasks. Especially those interviewees who had been CIOs several decades ago described that their task was to strategically manage IT – which had variously been called EDP, IS or IT at specific times.

We asked interviewees to describe the relationship between business strategy and IT. With one of the questions we asked them to explain how managers and executives needed IT in the past and currently. Past means at the beginning of their CIO career and currently either at the time of the interview or when the interviewee had discontinued to work as a CIO. Contrary to the IT/CIO role definitions of CIO research at the emerging of the CIO term [e.g. 5], twenty-three interviewees told us that in the past, IT was seen as some kind of necessary evil, as a collection of technologies and tools, a support function or a cost center. Only a few explained that in the past, IT was considered important or critical to business. Some also pointed out that IT people were considered "snobbish" like CIO12 who told us: *"We were respected because no-one understood what we did."* Most of the interviewees explained that business executives believe currently that IT can be deployed to create new digital services and new business opportunities. Echoing others, CIO21 said: *"Nowadays business leaders see two roles for IT. They recognize that basic IT services exist in every organization*

but also that IT has the capability to create new strategic opportunities. I need to manage both these roles of IT in a balanced way." On the other hand, most interviewed CIOs told us that business executives seldom understand what is really required to deploy IT. Business managers and executives have poor concrete level understanding about the connections between processes and IT. Due to that and perhaps other reasons, most of them find it difficult to understand why the development and/or implementation of information systems absorb so much time.

Thirty interviewees told us that they currently – that is, either at the end of their career or at the time of the interview - participate into the business strategy process of their organization. Some organizations have separate IT strategies, which are aligned with business strategies. In other organizations, business strategies cover IT as well and there is only one strategy. Especially those CIOs who had long careers and had started their CIO careers in the sixties or seventies, told us that strategy work was not conducted in its current meaning. Five interviewees explained that their organization did not have any strategy process at the start of their CIO careers. Budgeting and budget follow-ups were the closest to a strategy process. Thus it appears that CIOs' participation in strategy work follows the evolution of strategy work. Yet, only a few of the interviewed CIOs claimed that IT and processes are considered to be critical parts of business strategy.

Our interview findings show clearly that the significance of business strategies has increased as the determinant of CIOs' work. Three questions remain. How many have experienced that there has been major change(s) in business strategy during their CIO career? How has such change(s) impacted their role and tasks after the change(s)? Have CIOs through their role and tasks influenced the business strategy of their organizations?

Of the thirty-six interviewed CIOs, thirty-four explained that there had been at least one major business strategy change during their CIO career. Thirty-two indicated that the strategy change had influenced significantly their work. Quotations from the interviews speak for themselves. CIO12 described the strategy change: *"There are two new main trends: from local to global and providing services to customers 24/7. For me this means that we (=IT) have to replace local information systems with shared (global) information systems. We also need to replace our bespoke information systems with packaged information systems and learn how to purchase best of breed software from the markets."* CIO12 also explained: *"Now (in 2012) we are a part of the strategy process all the time. The expectation is that IT follows the strategic and organizational directions of the business. If business is reorganized I am expected to do the same in IT".* CIO2 described the strategy change of his organization: *"This year (2012) the strategy has been renewed a lot. It has been divided into four parts. The main theme is to build on our current strength, to continue to win markets with this spearhead strength by using the power of key brands… As a whole our goal is to execute a successful digital transition".* CIO2 then described the influence of the strategy change on him and IT in general: *"Now IT specialists participate to the creation of strategy to business. I need to consider what needs to be done so that in 2015 we have achieved these new metrics. The biggest strategic change is to bring our work culture and the way of doing things to this day. There is no longer traditional and digital ways of doing things … the organization has to change. We need to learn how to use new channels and develop results to those channels."*

Although each interview was unique, thirty-two of them described the influences of changes to business strategy in the tone of the quotations above. Their impact on business strategy was not equally obvious although thirty CIOs participated in strategy work. For example, CIO2 expanded: *"IT develops solutions to business and changes the ways of doing things. We participate to the creation of (business) strategy and objectives and find ways how to achieve them with the help of technology."* CIO34 describes that there are several ways to participate: *"Currently (2012) in (organization 34) IT is involved already during the idea phase. The real question is do IT have something to contribute with at that phase? We could also be in a listening mode".* Yet, the most typical description in the interviews was to just describe that IT participates in the strategy process, such as CIO10: *"IT participates the to strategy process of (organization 10) and brings along the ideas of the IT function."*

4.3. Limitations

A clear limitation of our study is that data has been collected in one European country. On the other hand, most of the interviewees work in large domestic, regional or global organizations. Thus, we believe that the participating organizations are representative of developed Western economies.

Although we have done our best to collect, document and analyze the data as carefully as possible, it is possible that we have not discovered all meaningful findings. Our study also has the typical limitations of qualitative interview studies [62].

5. Discussion

We discovered that the modified Leavitt model is a useful description of the factors that determine the tasks and the role of CIOs in general and at particular times in specific organizations. The model describes boundaries for CIOs' work and shows what kind of impacting factors a CIO needs to consider when s/he performs her/his tasks. This is the main theoretical contribution of our work. There is a need for a model which describes factors that determine the role and the tasks of CIOs over time and the variety of technologies, strategy orientation, organizational forms or other issues that evolve over time, since previous model have been limited to and by those issues.

Both the literature reviewed and the interviews of the 36 CIOs showed that CIOs' tasks have changed significantly during the last four decades. Leavitt's model is useful for classifying and relating the volume-wise increasing, diverse and evolving tasks of CIOs to the four factors of the model. The model is also useful for classifying the findings of (previous) CIO research. With Table 4 we showed how that could be done for the strategy (=strategy, business model and governance) factor. This links our research to the CIO research reviewed.

During the same period, the description of the CIO role has remained unchanged. For example Benbasat et al. [5] in 1980 and Peppard et al. [47] in 2011 described the role of the CIO similarly. The CIO deploys and manages IT strategically in her/his organization in a business executive role. Yet, we discovered that the CIO literature recognized the business executive nature of the CIO's role already in 1980s, whereas the CIOs interviewed described that their role had been operative and technical at that time. The facts that CIOs reported to CFOs and seldom participated in executive board meetings and strategy work characterize this finding. In the light of this finding, the rapid evolution of technologies and the other factors in the Leavitt model, it is somewhat surprising that the role of the CIO has been described in the same way over the years.

Finally, we showed that the modified Leavitt model is a good description of how business strategy and changes to it influence the role and tasks of the CIO in a bidirectional way. We offer the text of the discussion section so far as our answers to the two research questions we raised in the introductory section of our article.

The factors of the Leavitt model are generic. For example business strategy impacts CIOs' work and vice versa. But one could ask: so what, isn't that intuitively obvious? We discovered that the work of each interviewed CIOs was unique and that their tasks change all the time, sometimes even during a single day. One could discover the same also from CIO research, especially evolutionary studies. Continuous rapid evolution means that there are all the time new or changed technologies, ideas and other issues that influence what CIOs do. Against this background, factors that describe the role and the tasks of CIOs can only be generic. The model is useful as it provides boundaries and helps to manage the myriad of changing issues by relating them to just a few factors.

Our study opens new venues for future research. We have already started a research project where we investigate the impacts of mergers and acquisitions on the work of CIOs. We have interviewed the CIOs of the merging organizations about what happened to their work before, during and after the merger and complement this data by interviewing other key persons of the mergers, including documents depending on their availability. Mergers as well as major after-merger business strategy changes are so called "punctuations". We have begun to use the punctuated method based on the Leavitt's model in our ongoing research [42], the environment factor included.

Another avenue is to investigate deeper how CIOs and IT functions participate in the strategy process. We discovered that a few CIOs were not involved in the strategy process and that in some other cases the participation was rather limited and/or passive. Interviewees told also that business executives had difficulties to understand the strategic role of IT at a concrete level even though their understanding had increased on a general level. Considering the role of IT, why is this still the situation? What are performance and other organizational consequences of not understanding the strategic significance of IT or "digitalization"?

Our message to practitioners who want to deploy IT successfully is that they should better understand the strategic role of IT in concrete terms. IT interrelates with strategy, processes and people. Without nurturing these interrelations the value creation potential of IT is lower. Our other advice is to include the CIO of the organization as well as the IT function actively in the strategy process where this is not the case or is carried out only superficially.

6. References

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