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M.Sc. ICT in Business and the Public Sector

Thesis

Roles, position and IT governance of the departmental CIO at the Dutch central government (Rijksoverheid) and its maturity potential.

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Abstract

The position of departmental CIO was initiated (in 2008) in order to control & supervise IT projects on strategic ministerial level and make crucial steps in the organization and coordination of information management within the ministry. As ministries differ in scale and vitality of the IT activity, the CIO function differs per ministry. In this study, we have examined the leading roles, position, IT governance and maturity potential of the departmental CIO.

In the literature section, we have defined seven main themes in order to clarify the CIO environment and made the distinction between the general interpretation of the CIO, public sector CIO interpretation and what is already known in Dutch central government context.

As the definition of Chief Information Officer (CIO) firstly emerged during the '80s as a senior executive responsible for establishing corporate information policy standards and takes management control over all information resources. The CIO in Public sector context emerged during the '90s were the environment of the Public sector CIO is known to be less flexible and more risk-averse in contrast with their private sector counterparts. In terms of responsibilities, we have seen the Rijksoverheid CIO holds mainly responsibility in the domains of IT strategy, information portfolio management and raises advice- and prioritize IT among ministry board members.

In terms of roles and position, several sources stated the rapid evolvement of technologies which enlarged the CIO role and also influenced the position of the CIO within the organization. In Public Sector context we have mainly found that the CIO has to report to several higher positioned members and leadership ability has a crucial element in order to enhance the relevance and value of IT.

In order to organize the IT governance, a distinct vision in several domains such as political forces, market forces (technical relevance), customer forces (citizen minded) and internal forces emerged including well-devinded decision mechanisms and measurement metrics to accomplish the vision. Furthermore, we have assed three maturity models in the relevance of this study and found that IT value created by the CIO in the public sector is concerned towards economical value (cost reduction) and political value (information accuracy and social benefits).

In order of the literature review, we have found several knowledge gaps concerned the domains of responsibilities (digitalization and appliance of data), roles (enlargement CIO role), IT governance (IT strategy alignment and IT decision making) and maturity (relationships of the CIO within the environment). To address these gaps qualitatively, an interview guide was conducted, and we were able to speak all 12 ministerial CIO's were finally 11 CIO's contributed and 1 deputy CIO.

The result section states the average period CIO's were fulfilling this position was three years, were most CIO's (5 out of 12) were performing this position of CIO combined with the function pSG (ministry board position). Also emerged that CIO's felt responsible in the domains of data, information and digital transformation. However, the roles they were performing were mainly in the domain of advising top management in terms of IT, controller, coordinator, and motivator. Also, the IT strategy was mainly declared in following the ministry strategy and raise support in order to formulate new policies.

In conclusion we have found several contradictions during this study. Were the literature states that the CIO has to build credibility in terms of relationships and simultaneous have to build (economic and political) IT value to become strategic relevant, we have mainly seen several CIO's which were shortly established in this position and had an agenda-setting role. However, more experienced CIO's declared during the interviews decisive relevance (leadership) is crucial in this role.

In terms of maturity attributes several studies elaborate already on the leadership ability of the CIO. We've raised the attributes of IT decision structures including evaluation methods and enlargen the public value of IT (citizen minded, technical relevance, mutual responsibility of IT at several levels) in relation to the departmental CIO.

Table of content

List of Figures

List of tables

Chapter 1. Introduction

The first chapter of this thesis presents the research scope and the CIO evolution within the Dutch central government (Rijksoverheid). Followed by key definitions and a structured outline of this thesis document.

1.1 Background

Since the last decade, IT has become more crucial in primary and secondary processes within the ministries of the Rijksoverheid. In order to participate in the rise of IT, the cabinet decided that control and direction of IT projects was beneficial.[1]

1.1.1 The early-beginning of the departmental CIO at the Rijksoverheid

In the year of 2007, the Rekenkamer notified that ICT-projects of the Rijksoverheid were frequently over budget and did not accomplish the expected results within time. Therefore, this was not a problem exclusively for the Rijksoverheid, but occurred in several business sectors. Hereby, much literature was available about the risks of IT projects, but the management of IT risks remained difficult. [2]

Upon request of the cabinet, the Algemene Rekenkamer conducted a research according to the problems of ICT-projects within the Rijksoverheid[2]. In the published report the main findings concluded that ICT projects were often too ambitious and too complex by a combination of political, organizational and technical factors. Often these ambitious projects demanded a combination of employees, resources and time.

An illustrative representation of this tension field is exposed by figure 1.

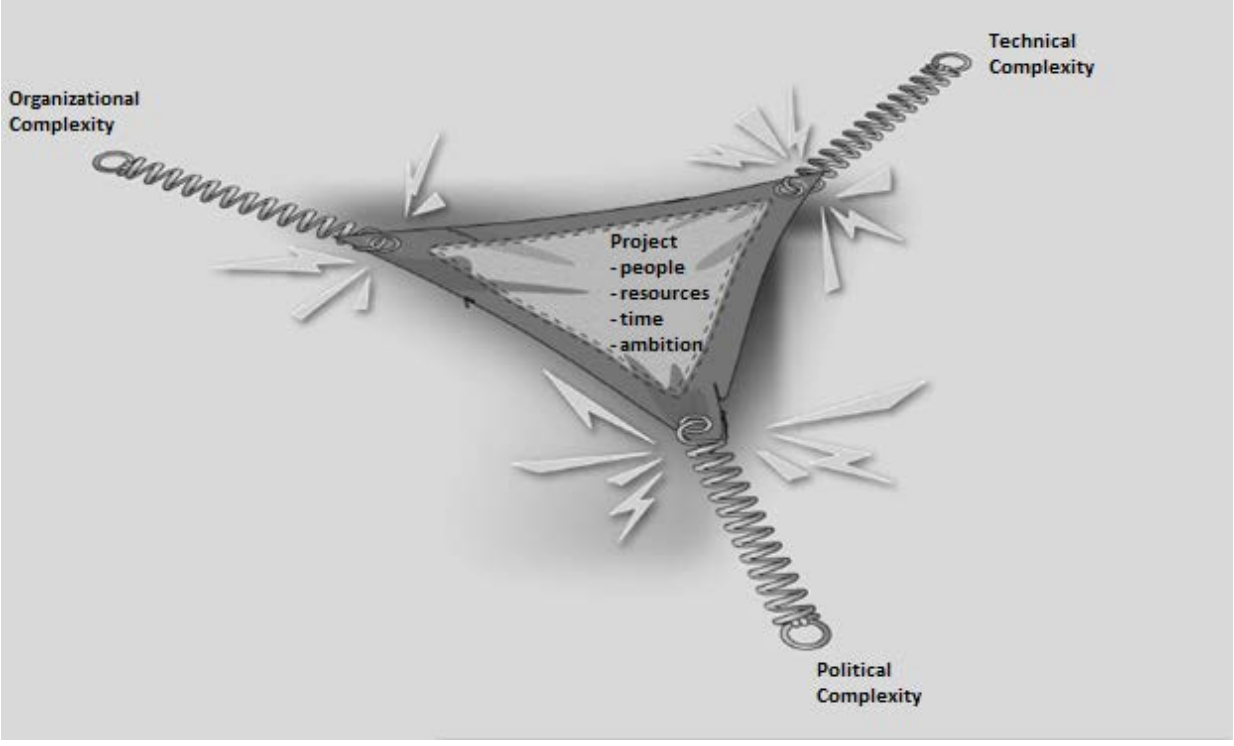

Figure 1 Schematic force field of Rijksoverheid IT projects [2]

[1] Kamerstukken 2008/09 135 ICT, 26 643, 135 (kamerbrief). (2008). Retrieved from Officielebekendmakingen: https://zoek.officielebekendmakingen.nl/kst-26643-135.html
[2] Algemene Rekenkamer. (2007). Lessen uit ICT-projecten bij de overheid Deel A.

In addition, ministers aim to present ICT projects ambitiously by defining concrete and nearby deadlines. As a result of this, ICT-suppliers need these extensive projects in order to continue their business proposition. These actors tended to complement each other. However, the Business (de Rijksoverheid) needed to feel in charge for the responsibilities and budget planning of the projects and had to make crucial steps in the organization and coordination of information management.

An important point of attention is that there must be enough people in the organization with sufficient knowledge and skills to manage, organize and realize the provision of information and ICT. [3]

According to the findings of the Rekenkamer, the position of CIO could fill this gap and be the official at a strategic level. And realize the link between the organization and the provision of information. The CIO must both have insight into the processes of the organization and be familiar with the problem of information provision and with the possibilities and limitations of ICT solutions.

The Chief Information Officer (CIO) has a crucial function in the control and direction of IT projects within ministries. By the year of 2008, some ministries had filled in the position of CIO as a function, while other ministries combined the role of CIO with other managerial roles and even some ministries had not a CIO. Upon the recommendation of De Rekenkamer is decided that every ministry need a CIO in terms of function or role.

1.1.2 The departmental CIO in the last decade (2008-2018)

In the period from 2008 to 2012 became apparent that ICT projects still prove difficult to manage after the introduction of the CIO role. [4]

A committee was therefore set up in mid-2012 to research the manageability of ICT projects.[5]

In the final report of the Elias Commission, the following ten conclusions emerged:

1. The national government has no control over its IT projects.
2. The politicians do not realize it, but ICT is everywhere.
3. The national government does not fulfill its ICT policy ambitions.
4. The accountability and decision-making structure in ICT projects is very poor.
5. The central government has insufficient insight into the costs and benefits of its ICT.
6. The ICT knowledge of the national government is inadequate.
7. ICT project management is not well managed.
8. ICT procurement processes contain contradictive incentives.
9. Contract management for several ICT oriented projects is not well coordinated.
10. The government lacks significant improvements or learning ability in the field of ICT.

The report of the Elias committee states: Because of major ambitions in the field of ICT and a whole of opaque ICT organizations, tasks and responsibilities are fragmented and unclear. The government must also act decisively and radically to get its IT projects under control. The cabinet is often not aware that ICT is related to every topic of the policy area.

The Elias Committee also concludes that it is mainly the large ICT projects that fail. The main reason is the obsession to achieve impossible results, making the project too massive and complicated. In addition, project management is not in order due to responsibilities, risks, and interests of the end-user that are not sufficiently monitored.

Recommendations made by the Elias Committee:

- BIT: small and effective department for the review of ICT projects >5 million. Furthermore, BIT has an advising role towards the cabinet.
- Departmental CIO's need to priotize the control of ICT-projects and need perseverance power.

[3] Algemene Rekenkamer. (2008). Lessen uit ICT projecten Deel B.
[4] De Rekenkamer. (2012). Aanpak van ICT door het Rijk 2012.
[5] Tweede kamer der staten generaal. (2014). Parlementair onderzoek naar ICT-projecten bij de overheid.

- The business justification of ICT projects is not only relevant at the start, but also during a project and dare to stop the project.
- It is vital to attract and retain capable IT staff.
- The departmental CIO ensures that roles and responsibilities are clearly invested.
- Ensure that everyone, which is involved, has an interest in a successful project.
- Information is obligated to share with top managers.

In response by the Cabinet to the Elias Committee report, is decided to determine a profile of the departmental CIO. This profile includes a set of function-requirements according to the fulfillment of tasks by a departmental CIO. Hereby the departmental CIO is responsible for the realization and actualization of the departmental I-strategy, supervises the organization in the development of I-policies and effective application- & portfolio management.[6] Also, the CIO determines structures and supports audits. Finally, we see a main role shift in the profile of the CIO. As the CIO was introduced as a control and advice function of IT. Recently we recognize developments to broaden the definition by priotizing the need and use for IT. Which is phrased: "I centralized in departments and policies". [7]

1.1.3 Departmental CIO role vs function

The structure of the information household (I-function) differs per ministry. There are ministries where the I-function focuses on operational management (such as office automation), but also ministries where the I-function is a driver and component of the primary process. The departmental CIO has the task to assess large ICT-projects, compose the departmental I-strategy and keep control of IT-portfolio management. [1]

Stated is that organization of the CIO position within ministries is free for interpretation. In most cases, this role is assigned to existing officers. However, the role is not without obligation. The responsibility of a CIO in their role is that ministries will not start projects with a large ICT component without the CIO having given an opinion on this.

Ultimately, the Ministry of BZK has a liable task within the CIO system of departmental ministries. By organizing common guidelines, frameworks and principles, the ministry of BZK (department CIO-RIJK) has a leading role in the CIO system of the Rijksoverheid. Based on the twelve departmental CIO's and one director of CIO-Rijk this CIO-deliberation forms the CIO system of the Rijksoverheid. [3]

Ministry	Departmental CIO role/function 2012
Algemene Zaken (General Affairs)	Role
Buitenlandse Zaken (Foreign Affairs)	Role
Binnenlandse Zaken (Interior and Kingdom Relations)	Role
Defensie (Defence)	Function
Economische Zaken (Economic Affairs)	Function
Financien (Finance)	Function
Infrastructuur & Milieu (Infrastructure and environment)	Role
Onderwijs, Cultuur en Wetenschap (Education, Culture and Science)	Role
Sociale Zaken en Werkgelegenheid (Social Affairs and Employment)	Role
Veiligheid en Justitie (Justice and Security)	Role
Volksgezondheid, welzijn en Sport (Health, Welfare and Sport)	Function

Table 1 Schematic overview departmental CIO role/function 2012 [4]

[6] Rijksoverheid. (2016). Profiel departementale CIO-organisatie .
[7] CIO beraad. (2018). Profiel departementale CIO en CIO-organisatie.

1.1.4 Governmental CIO's

Before the Rijksoverheid introduced the role of CIO, the role was already known and established in several national ministries out of the Netherlands. One of the first countries, which introduced the role of governmental CIO, was the American government in 1996. As the role of CIO evolved over the years, the Rijksoverheid keeps aware of governmental CIO developments worldwide and conducts periodical research. [4]

As we look in terms of the development and availability of e-government, we can observe that the Rijksoverheid scores well above the average. [8]While years ago a country as Estonia was one of the leaders in the e-government strategy. [9]These days we see a leading role for Denmark and Australia. In terms of Government innovation climate, we see also a high ranking for Denmark.[10]

America

Within the American government, the role of CIO in 1996 was determined to utilize Clinger-Cohen Act. This law was introduced in 1996 whereby all budget holders of the US government are mandated to use a portfolio approach when making investments in IT, as is also the case with for example asset managers on the financial markets. In addition, a CIO was appointed for the larger government export organizations, which was envisioned to be a top-level executive who would provide strategic insight into how IT could be used to deliver public services. [11]

Denmark

According to research in 2015, there is a CIO at national and ministry level. However, there is no single CIO position in the Danish government. In terms of e-government, the Joint-Government Cooperation is responsible.[12] As there were multiple sources according to the e-government strategy of the Danish government.[13] We could not find (English) sources in terms of CIO definition, profiles and introduction.

Australia

We see in the history of the Australian Government Information Management Office that the awareness of IT management started in 1994 by assessing technologies by the technology review group within the ministry of finance. However, the introduction of an information management office was in 2004[14] and the introduction of the CIO role were in 2008. In the year 2012, the information management office added the role of CTO. After this introduction the CTO was focused towards the infrastructure and the CIO focused towards ICT governance, policy and investment advice concerning information and ICT for the entire government.[15]

[8] E-Government Development Index. (2018). Retrieved from publicadministration.un.org: https://publicadministration.un.org/egovkb/en-us/Data/Compare-Countries
[9] Keijzer, H. (2014, december 18). In Estland zijn ze zo gek nog niet. Retrieved from CIO: https://cio.nl/overheid/84840-in-estland-zijn-ze-zo-gek-nog-niet
[10] European Innovation Scoreboard. (2018, august 21). Retrieved from Europa: https://ec.europa.eu/growth/industry/innovation/facts-figures/scoreboards_en
[11] DEPARTMENT OF DEFENSE . (1996). Clinger Cohen Act of 1996, Title 40 .
[12] Obi, T., & Iwasaki, N. (2015). A Decade of World e-Government Rankings. IOS Press.
[13] European Commision. (2015). eGovernment in Denmark.
[14] Australian Government Information management office. (2004). The Australian Government Information Management Office Archive. Retrieved from Australian Government Information management office: https://www.finance.gov.au/agimo-archive/about/history.html
[15] Apostolou, N. (2012). Australia gets new CIO and CTO. Retrieved from theregister: https://www.theregister.co.uk/2012/12/17/agimo_gets_torn_up/

1.2 Research objective

In 2008 the role of departmental CIO within the Rijksoverheid was introduced with the focus towards control of IT projects.[1] During the last decade several evaluations took place with regard towards the control and performance of IT projects.[4] Furthermore, a profile of the departmental CIO was set, which holds the responsibilities and mandate of the departmental CIO.[6]

However, the role of CIO was introduced in 2008 and free for interpretation by each ministry. The Rijksoverheid aimed at setting best practices and forming common ground between the departmental CIO's of the ministeries.

This research investigates the departmental CIO in terms of internal ministry CIO roles, position and IT governance of the CIO. Based on a qualitative research approach data will be gathered in order to represent a general impression of the departmental CIO. Furthermore, these outcomes will be discussed, and raise input for future maturity model potential.

By this research, the Rijksoverheid gains insight in the organization of the departmental CIO role, departmental CIO position and CIO office, which enhances the current definition of the departmental CIO and assess the next phase in future role developments.

1.3 Research question

The purpose of this study is to research the roles, position and IT governance of the departmental CIO within de Rijksoverheid and assess the departmental CIO maturity attributes. Based on these critical elements the following research question has been conducted:

Main question:

What are the roles, responsibilities, position and IT governance of the departmental CIO at the Dutch central government (Rijksoverheid) and what is its maturity potential?

Sub-questions:

Sub-questions related to the departmental CIO role

- "What are the responsibilities and roles of a departmental CIO at the Dutch national government?"
- "Which factors contribute to the position of departmental CIO at the Dutch national government?"
- "How is IT governed and organized by a departmental CIO within the Dutch national government?"

Evaluative question

- "Based on the departmental CIO responsibilities, roles, position and IT governance, which maturity attributes can be added to existing CIO maturity models in Dutch central government (Rijksoverheid) CIO perspective?"

1.4 Delimitations

This study focus on the departmental CIO's including supportive offices of the 12 ministries of de Rijksoverheid (ZBO's and implementation organizations will be excluded). Because the focus of this research will concentrate on the roles, positioning and IT governance of a CIO, other C-level executes such as CTO will be not included in this study. If C-level executes were clarified this would be as a supportive instrument in terms of relevance to the CIO.

In Terms of IT governance, this study includes the organization, delegation of IT principles and IT alignment in terms of business strategy by the CIO. However, excludes the entire IT governance of ministries.

Furthermore, the IT value creation is related to the value the CIO has control of. And value, which can be derived from the use of IT.

Finally, in terms of maturity potential maturity attributes will be discussed and unique maturity attributes will be suggested for specifying current CIO maturity models or as an accelerator for future research.

1.5 Definition of key concepts

Some terms were used frequently in this thesis. Therefore some key concepts were clarified in this paragraph.

Rijksoverheid, Rijk, is the comprehensive definition of all Dutch ministries, operating services and inspections combined. [16]

Chief Information Officer, CIO, senior executive who establishes corporate information policies/standards and is in charge of all information resources within the enterprise. [17]

Departmental CIO, performs leadership and management to a department in the area of information policies/standards and information resources.[18]

CIO Role, shaped responsibilities of the CIO[19]. Main role according to Gartner was a delivery executive in the past and a business executive nowadays. [20]

CIO position, characteristics which determine the effectiveness, enabling factor and establishment of the CIO within the organization. [21]

CIO maturity, assessing indicator, which identifies the current situation and prescribes a reasonable next phase in the development of the CIO function. [22]

Private sector, entities owned, established and managed by private individuals, to make profit. Examples of private sector organizations include: companies, partnerships and co-ops. [23]

Public sector, Public sector refers to the government sector of the economy, organizations owned and run by the government. Examples of public sector organizations include: public corporations, local councils, state services. [23]

IT Governance, The mechanism to establish and perform the goals and objectives of the IT strategy and contribute to high level enterprise objectives. [24]

pSG, deputy secretary general.

CIO Council, The management team of the CIO and the CIO's of related executive organizations.

CIO board, The internal IT organization were CIO's and CIO office meet.

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[16] Rijksoverheid. (2018). Organisatie Rijksoverheid. Retrieved from Rijksoverheid: https://www.rijksoverheid.nl/onderwerpen/rijksoverheid/organisatie-rijksoverheid
[17] Synnott, W. R., & Gruber, W. H. (1981). Information Resource Management:Opportunities and Strategies for the 1980s. New York: John Wiley & Sons.
[18] Department of the Treasury. (2018). Chief Information Officer (CIO). Retrieved from Treasury: https://www.treasury.gov/about/organizational-structure/offices/Pages/Chief-Information-Officer.aspx
[19] Ross, J., & Feeny, D. (1999). The Evolving Role of the CIO.
[20] Gartner. (2018). Mastering the New Business Executive Job of the CIO.
[21] Hawkins, B. (2004). A Framework for the CIO Position. EDUCAUSE Review, 39(6), 94-98.
[22] Becker, J. (2009). Developing Maturity Models for IT Management . Business & Information Systems Engineering June 2009, Volume 1, Issue 3, 213-229.
[23] Satyaprasad, B. (2012). Business Organization and Environment .
[24] John Campbell, C. M. (2009). PUBLIC AND PRIVATE SECTOR IT GOVERNANCE: IDENTIFYING CONTEXTUAL DIFFERENCES. Australasian Journal of Information Systems.

1.6 Structure of the report

The first chapter of this thesis holds the background and the research aim of this study, the following chapter (chapter 2) gives an insight of the available research in the domain of the CIO environment in terms of responsibilities, roles, position, IT governance and maturity. Each of these elements will be considered in general, public sector and Rijksoverheid context which forms the foundation of the research gaps which will be considered in this study.

The third chapter holds the research strategy and methods to perform this qualitative CIO study and raise the foundation how the interview guide among the CIO interviews was conducted, and results were analyzed and retrieved from the interview analysis.

Chapter four holds the results of this study and analyses frequent topics which were formulated during the interviews with the participated CIO's during this study.

In chapter five results of this study will be discussed and related in terms of the theoretical framework which is formed in chapter two.

Finally, based upon the research questions, frequent results retrieved from the interviews and relevant topics which emerged during the discussion phase of this study a conclusion will be formulated in the last and sixth chapter. Also, recommendations and areas for future research will be raised during this last chapter.

Chapter 2. Relevant literature and theoretical framework

This chapter holds a literature review according to the departmental Chief Information Officer and it's definition, responsibilities, roles, position, CIO maturity and IT value creation. When describing these attributes, three streams will be composed. First, every paragraph starts with the general interpretation of this attribute. Secondly, this attribute will be specifically described in public sector context, and third the available literature in Rijksoverheid context is displayed. Finally, this chapter holds a summary of each paragraph and a research gap which forms the foundation for the qualitative phase of this study.

The following figure holds a graphical representation of the subjects discussed in this chapter in relation to the research questions.

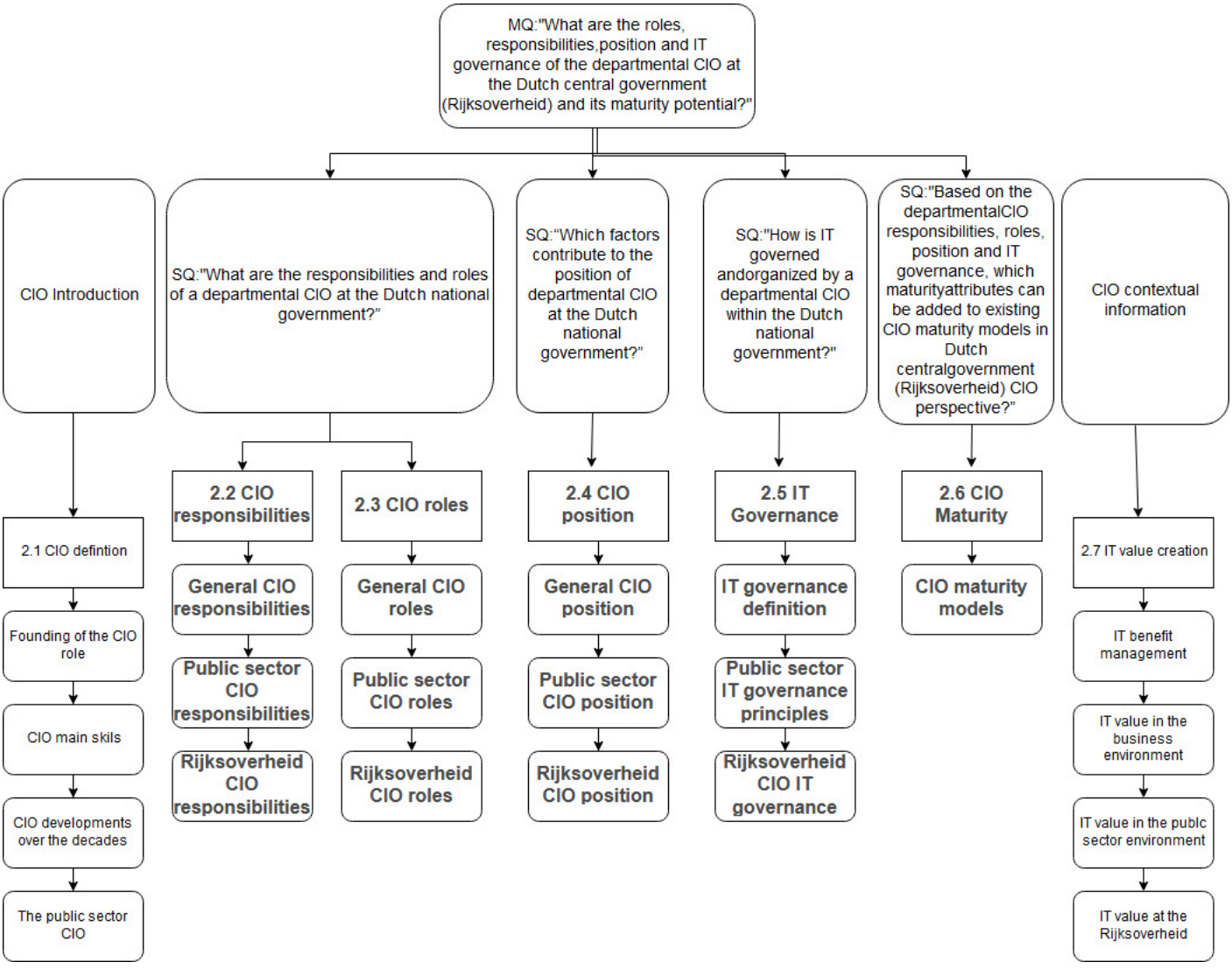


Figure 2 Representation of the theoretical framework

2.1 CIO definition

Lawry & Waddell[25] cited Syncott and Gruber as the first who introduced the definition of Chief Information Officer (CIO) as follow: 'senior executive which established corporate information policies/standards and is in charge for all information resources within the enterprise'.[26] According to Rockart was the function of information systems execute in the 60's and 70's mostly "technically oriented" and evolved the function of CIO in the 80's by the trend of distributed data and new technologies which were widespread over the entire organization.[27]

Rockhart stated that by the increasing responsibility for information resources and the fact that technology trends affect staff and future business strategy, the CIO role was related to top management insights and coordination, which needed several skills to fulfill this role. [27]Which can be summarized by six main skill attributes[25] :

- Has a sense of political, communication and organizational skills.
- Has understanding, experience and understanding of overall business management.
- Has technical understanding and the ability to manage technical experts.
- Is able to develop human resource management skills.
- Through sees strategic opportunities and could manage strategic plans and changeability.
- Sensitive towards human, social and organizational impacts of new technology. In addition, is able to proactively plan.

We can observe that most of these defined skills are managerial oriented and a few of them are absolute technical skills. Another founding for the technical to managerial transformation of the CIO role was that information systems involve strategic and operational alignment to support the business goals.[28] Besides the strategic perspective the CIO holds, we found that during the 1980s the technology evolution also accomplished a rise in corporate data, which made information into an Asset. Particular in areas were added information could be used as a competitive advantage. The new challenge, which emerged for CIO's, was to translate IT into a competitive advantage.[29] The CIO had to observe beyond technology alignment and became involved in business concerns. As a result, the CIO also became a business consultant, strategic planner and had to make competitive analyses.[30]

By the higher influence of IT as an asset and the active participation in strategic planning by the CIO, begin 1990s a study concluded that the CIO has an active role in the overall organization strategy and could link the external entities, IT policies and operation areas, which transformed the CIO role from manager towards an executive role.[31] Based on a study about the executive influence and position of the CIO, Grover concluded that CIO's were generally more supportive oriented in consideration with other executes such as chief financial officers. According to Grover, CIO's had to gain a broader network within organizations and be alert for new technical capabilities.[32]

End of 1990s some emerging technologies were widely adopted such as internet and email. Moreover, most large private companies had a CIO in their managerial board. Also, the role of CIO was introduced in the public sector.[33] The Clinger-Cohen act was performed by the US government to

[25] Lawry, R., & Waddell, D. (2007). CIOs in the Public Sector: Their Roles,Responsibilities and Future.
[26] Synnott, W. R., & Gruber, W. H. (1981). Information Resource Management:Opportunities and Strategies for the 1980s. New York: John Wiley & Sons.
[27] Rockart, J. F. (1982). The changing role of the information systems executive: A critical succes factors perspective.
[28] Benjamin, R. I., Dickinson, C., & & Rockart, J. F. (1985). Changing Role of the Corporate Information Systems Officer. MIS quarterly, 177-188.
[29] Passino, J. H., & Severance,. (1988). The changing role of the chief information officer. Strategy & leadership, 38-42.
[30] Dixon, P. J., & John, D. A. (1989). Technology Issues Facing Corporate Management in the 1990s. MIS quarterly, 147-157.
[31] Stephens, C. S., & Loughman, T. (1994). The CIO's chief concern: communication. Information &. 129-137.
[32] Grover, V., Jeong, S.-R., Kettinger, W. J., & Lee, C. C. (1993). The chief information officer: a study of managerial roles. Journal of management information systems,, 107-130.
[33] Theodoulidis, S., & Babis, A. S. (2006). CHIEF INFORMATION OFFICER: A JOURNEY THROUGH TIME.

investigate about the CIO role would fit from private organization perspective in a public sector form. The research concluded that the CIO in the public sector had to be in a leadership position and besides notifying trends has to be cost avoidance and resource saving. [34]

In the year 2000 with e-business strategy's, mobile and upcoming experienced users the CIO role changed more in a leadership function who could have a significant influence on the business value proposition and business strategy. [35]

By the growing importance of IT as a strategic asset, the role of CIO grows from an advising executive towards an initiative and quick responding executive. Which was able to manage change, foresees the organization in a futuristic manner, stay competitive in technology terms and hang on in difficult times when budget and time planning were unrealistic. [25]

Mid 2000's cloud computing arise including the awareness of information security, which made the role of CIO from an innovative business leader into a risk managing policy maker. [36]

In the last decade (2010) digital transformation became a hot topic. New technologies emerged which automate business processes such as artificial intelligence, 3d printing, internet of things and big data. Which challenge the business-IT alignment vision or could clash on this territory. [37]

> *"In short we can conclude according to Remenyi that the CIO needs to be a sort of human Chameleon in the years that the CIO role exists it had to overcome drastic changes and find new abilities on a strategic and tactical level."* [38] *Especially because of the rapid phase new technologies occur*[29] *and their impact in the competitive field of business competitors.* [32]

The public sector CIO

As the definition of CIO first emerged in the private sector[26], the public sector followed up the private sector to introduce the role of CIO. [25]

Where political forces and the political system control the public sector, market forces and stakeholders control the private sector. As public- and private sector organization differs in the type of ownership. In terms of management, they function quite similar. Such as the aim to conduct organizational purpose, motivating human resources and control organization performance. [39]

In order to define the main sector differences (public vs private), Lawry & Waddell conducted an adaptive model for the public sector characteristics of CIO perspective based on an intensive literature study which is displayed in figure 3. [25]

[34] Buehler, M. (2000). U.S. federal government CIOs: information technology's new managers. Journal of Government Information,, 29-45.
[35] Reich, B. H., & Nelson, K. M. (2003). In their own words: CIO visions about the future of in-house IT organizations. The Data base for advances in Information Systems, 28-44.
[36] Zhang, X. (2010). Information Security risk management framework for cloud computing networks.
[37] Locoro, A. (2018). The CIO and CDO Socio-technical roles in the age of digital business transformation. Organizing the digital world, 235-245.
[38] Remenyi, D. (2005). The chameleon: a metaphor for the Chief Information Officer.
[39] Schneider, D. S., & Vaught, B. C. (1993). A comparison of job satisfaction between public and private sector managers. Public Administration Quarterly, Vol. 17, Issue 1, 66-83.

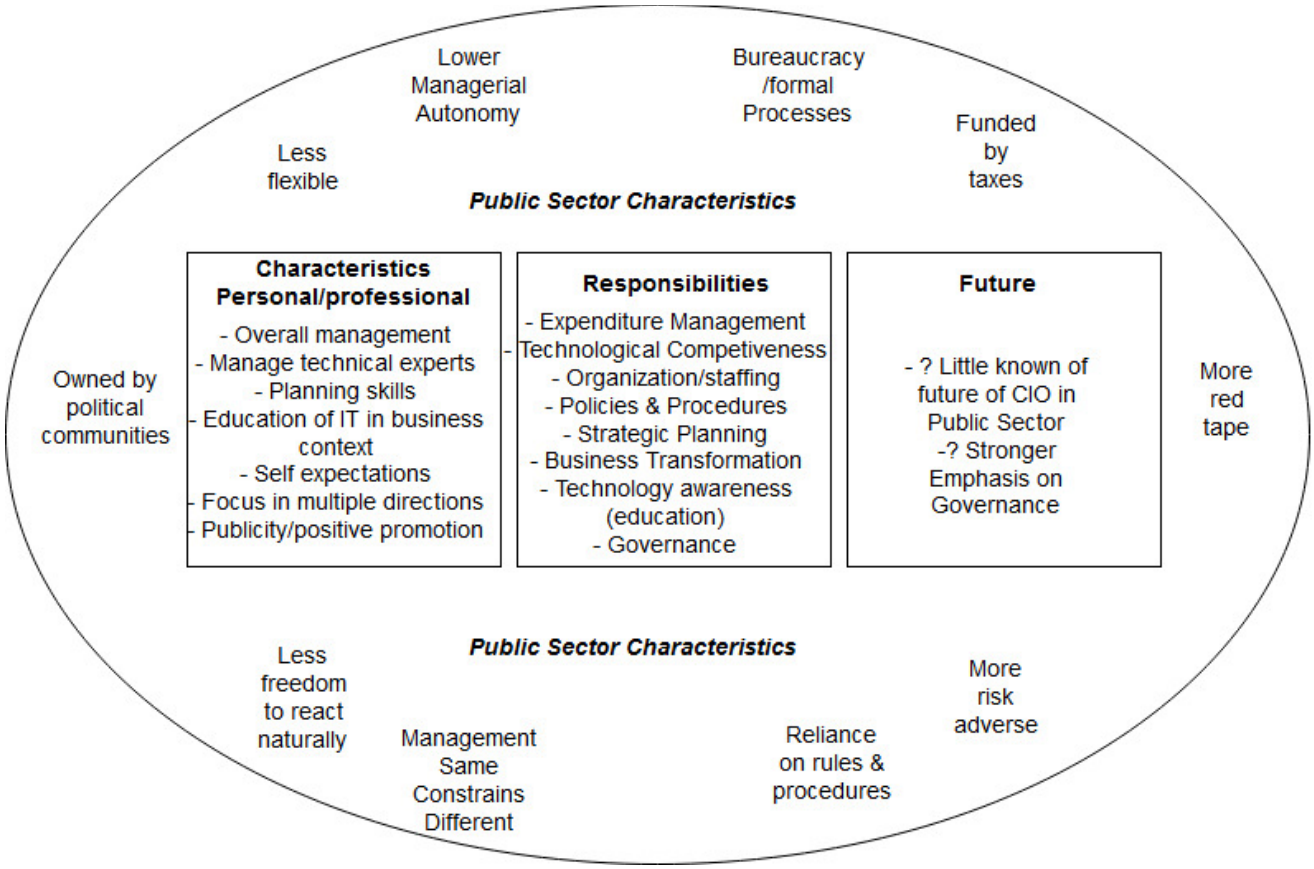


Figure 3 Public Sector CIO environment characteristics[25]

In addition to the model, Lawry & Waddell formulated three main findings according to the model which specifically relate to the CIO in public sector environment:

- More Bureaucracy: more significant amount of formal procedures and low amount of flexibility in the decision making process and has the intention to be more risk-averse then private sector enterprises.
- More Red Tape: implies a large amount of unproductive and procedural set of rules. In addition, the outcomes mainly controlled by rules instead of results.
- Lower Managerial Autonomy: which implies that managers have less freedom to react as circumstances arise.

The definition of CIO in the public sector is relative similar to the CIO definition in the private sector in terms of management. [39]*However, the CIO in the public sector has to deal with a greater extent of formal procedures, more risk-averse environment, rules and less freedom to react.*

2.2 Responsibilities of the CIO

As stated in the definition of the CIO according to Rockart, Passino and Dixon.[27] The definition and responsibilities of the CIO changed in a rapid phase over the last decades. As described by Theodoulidis and Babis [33] end of the 90's most enterprises had adopted a CIO in their managerial board, which is also recognized by the model of Feeny and Willcocks in figure 4. Were responsibilities such as Business and IT vision can be observed.

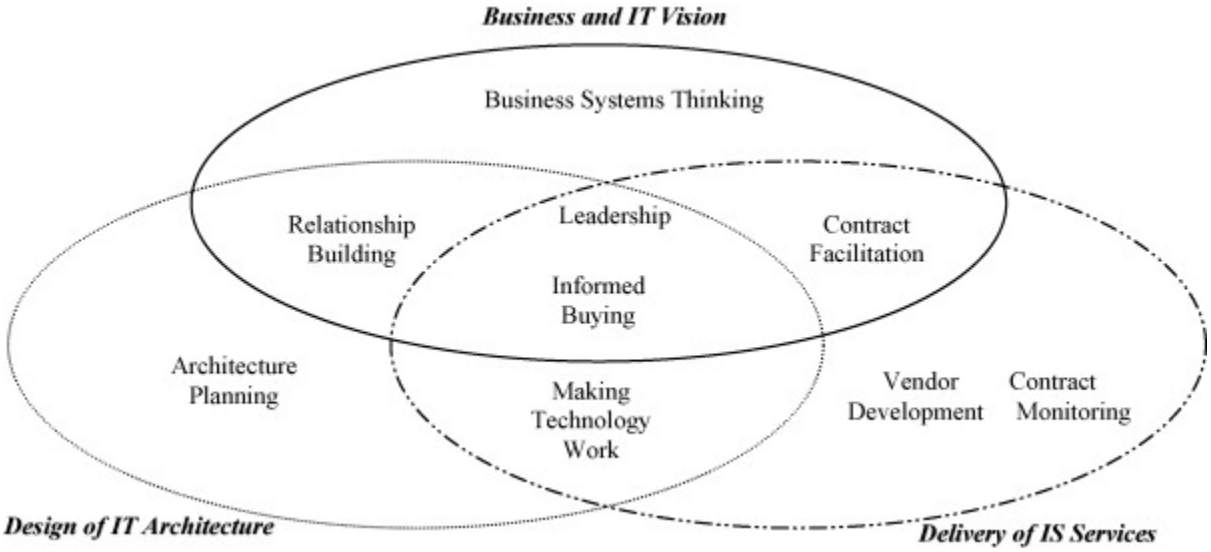


Figure 4 responsibilities of a CIO in terms of domains and responsibilities [40]

In 1998 Feeny and Willcocks described a set of responsibilities related to the CIO (figure 3), categorized in three main domains of the CIO responsibilities including Leadership (Business and IT vision, Design of IT Architecture, Delivery of IS Services). As we observe these three main categories, we can conclude that the CIO take notice of external factors such as contract management, established close relationships with business vision units and is responsible for the Information (technology) architecture of the company. [40]

> *Concluding to the model of Feeny and Willcock [40] there are three domains, which defines the responsibilities of a CIO. Namely Business and IT Vision, Design of IT Architecture, Delivery of IS Services including Leadership.*

As Feeny and Willcock summarize the responsibilities of the CIO in three domains. According to Polansky, Inuganti and Wiggins, the responsibilities of the CIO rises when the value of information becomes more critical. In a reflection of this fact, we see information along multiple points in the value chain (table 2). Furthermore analytical and forecasting capabilities become more obligated to plan and successfully manage the portfolio of IT investments. [41] In the following table of Polansky, Inuganti and Wiggins (table 2) a growing responsibility of the CIO in the enterprise value chain becomes more recently noticeable such as governance (finance, business continuity, security, privacy-related), business transformation and customer care.

Responsibility definition	**Summarized explanation**
IT strategy	Align the IT goals and objects with business goals and objectives. Alignment can be achieved by establishing IT-strategy, which concentrates on formulating solid business cases, based on projected returns.

[40] Feeny, D. and Willcocks, L. (1998) Core IS capabilities forexploiting information technology.
[41] Polansky, M., Inuganti, T., & Wiggins, S. (2004). The 21st Century CIO.

IT governance	As the CIO is facing increased pressure to measure results and gain value of IT. CIO's are obligated to establish robust processes and monitor the performance.
IT organization and staffing	The organization of resources and staffing related to the IT function has to be seen and covering the entire enterprise.
Technology and architecture	Decisions about adopting, training or leading edge in new technologies should be made from an enterprise perspective.
Technology awareness	The CIO is responsible for developing and selling technology at several levels of the enterprise. The CIO has to communicate a clear technology vision.
Corporate governance	The CIO had previously gain transparency in financial accountability. However, new corporate laws appear such as reporting, business continuity, security, privacy.
Business intelligence	The interpretation of gaining information and reporting has become a provider of forecasting and insight information is business value. The CIO has to design actionable business intelligence.
Business transformation	The IT department is expected to deliver speed, productivity, agility, and competitive advantage. The CIO has to perform a leadership role in quality programs and improvement strategies.
Customer care	The CIO is expected to deliver customer relationship management programmes, and customer oriented competitive advantages.
Internet and e-business	The internet will continue to present challenges for the IT department. The CIO has to be responsible for implementing e-business strategies and developing web-enabled applications, portals.

Table 2 CIO responsibilities [41]

As presented in table 2, most of the CIO's would not view themselves as technical oriented, but their perspective is mainly strategic: strategic focus, governance of IT and the management of mixed resources. [41]

According to the research of Polansky, Inuganti & Wiggins, the CIO responsibilities were in broad definitions: gain competitive advantage of IT, organize actionable data structure, organize IT governance and strategic alignment within the business.

As observed in previous studies, the responsibilities of the CIO expanded by the increasing value of information and competitive advantage by the use of IT.[41] In order to respond and handle the growth of digital capabilities, stay ahead to competitors and organize the digital business transformation several companies introduced the role of Chief Digital Officer (CDO). In this organizational setup, the CIO heads the IT function and is responsible for the IT strategy and it's execution. The Chief Digital Officer performs a business-oriented role in the representation of digital technologies. Such as interface points with customers, digital strategy and change management. As the responsibilities of the CIO keeps expanding, several companies introduced embranchments besides the function of CIO. Such as Chief Innovation Officer, Chief data officer and Chief technical officer which work besides the CIO.[42]

[42] Haffke, I., & Kalgovas, B. (2016). The Role of the CIO and the CDO in an organization's digital transformation.

As we observe the responsibilities of the CIO keeps expanding. Mainly by keeping up with the competitive environment, increasing value of information and growth of digital capabilities.[43] As a result of this growth in responsibilities, we see some companies that introduce the Chief Digital Officer role which is in charge of digital change and outfacing digital capabilities. However, in this organizational setup, the CIO keeps responsible for the overall IT strategy. By this event, we can observe according to the research of Peppard, Edwards and Lambert that the CIO becomes more an agility CIO which ultimately coordinates the IT strategy among several branched functions such as Chief digital officer. [44] Sheraz states that CIO's had to work closely with other CxO's such as Chief supply chain officer and chief marketing officer and has an ultimate responsibility to innovate, collaborate, balance IT budget and motivate IT staff. [45] As observed by the growing responsibilities of the CIO, some responsibilities become deligated or branched.

CIO responsibilities in the Public Sector

The CIO generally holds responsibility for the competitive advantage of IT and information including the relationships with other CxO's and departments (alignment/governance). [41] [45]

In the public sector CIO responsibilities are fast evolving due to the importance of ICT for government processes and electronic services. [46] In elaboration of this quote, Lawry & Waddell formulated eight responsibilities characterized by the public sector CIO. (table 3)

Responsibility
Expenditure management
Technological Competitiveness
Organization/staffing
Policies & procedures
Strategic planning
Business transformation
Technology awareness (education)
Governance

Table 3 CIO responsibilities in the public sector [46]

According to table 3 similarities towards previous findings of Polansky, Inuganti & Wiggins [41] can be observed such as Expenditure management, Technological Competitiveness, Organisation/staffing, Policies & procedures, Strategic planning, Business Transformation, Technology awareness (education) and Governance. However, actionable use of information and e-business/customer service is missing out in the study of Lawry & Waddell.

More recently The NASCIO (representing Chief Information Officers of the states) published a list of 10 top priorities for CIO's in the American public sector for 2018. As this list also includes specific strategies and management processes we can derive multiple responsibilities of the public sector CIO from this list. [47]

1. Security and Risk management: governance, security frameworks, data protection, training and awareness.
2. Cloud services: cloud strategy, scalable and elastic IT-enabled capabilities, service management and taking ownership of data.
3. Consolidation & Optimisation: consolidate services, infrastructure enterprise thinking
4. Digital Government: improve citizen experience, artificial intelligence, digital assistants, privacy
5. Budget, Cost Control, Fiscal Management: Managing budget reduction
6. Shared services: Sharing resources, service portfolio management, and organizational transformation.
7. Broadband/wireless connectivity: implementing broadband technology opportunities.

[43] Polansky, M., Inuganti, T., & Wiggins, S. (2004). The 21st Century CIO.
[44] Peppard, J., Edwards, C., & Lambert, R. (2011). Clarifying the Ambiguous role of the CIO.
[45] Sheraz, A. (2016). CIO, responsibilities and challenges.
[46] Lawry, R., & Waddell, D. (2007). CIOs in the Public Sector: Their Roles,Responsibilities and Future.
[47] Nascio. (2017). State CIO Top Ten Priorities for 2018.

8. Data Management and Analytics: data governance, business intelligence, predictive analytics and big data.
9. Enterprise IT Governance: enterprise IT policy and planning, improving IT governance
10. Agile and incremental software Delivery: Agile design and incremental delivery of software.

According to the priority list of NASCIO[47] and the research of Lawry & Waddell[46] we can conclude that the responsibilities of the CIO in the private and public sector are quite equal, which holds a focus towards: Expenditure management, policies & procedures, strategic planning, business transformation, governance, digital interaction, managing costs and actionable data management. However, in the findings of the general CIO interpretation we see a higher emphasis on relationship building, as the CIO in the public sector according to NASCIO research also holds responsibility for the security and risk management domain.

CIO responsibilities at the Rijksoverheid

The CIO at the Rijksoverheid was introduced as a countervailing power which has the primairy responsibility to enhance the IT function efficiently to accomplish business objectives. Therefore the responsibilities of the CIO were focused towards control of the IT function. However, as the Rijksoverheid observes IT has a rising stake in projects and operations, the CIO evolves in having advising and strategic responsibilities.[6]

Responsibilities (including sub-elements)	**Responsibility summarized**
Vision, strategy, business planning: - Conducting and updating the departmental IT strategy. - Align departmental strategy and general Rijksoverheid IT strategy	Conduct, align, update IT strategy
Advising/ prioritizing IT - Raise advice in objectives, operations, costs and risks, which relate to IT. - Strengthen the position and attention of IT in the primary process. - Raise consciousness and abilities about IT among policymakers and the other employees in the organization.	Advise, prioritize and train policymakers and employees according to the ability of IT.
Portfolio management - Advising and informing SG/DG in terms of objectives, costs and risks of IT projects. - Project portfolio management - Informing and reporting towards the ministry board (SG/DG) - Raise opinion in case of a project with an IT-component	Project portfolio management and report/inform in case of IT projects towards the ministry board (SG/DG)
Architecture and frameworks - Develop, assess and update departmental architecture and frameworks	Manage architecture and frameworks
Information- and cybersecurity - Supervise the appliance of informationsecurity in IT projects	Raise awareness in terms of security for new IT projects.
I-governance - Arrange governance in terms of information management and automation. - Organize roles, responsibilities, IT objectives	Organize governance and collaboration

- Arrange supervision and strategic aspects in collaboration with DG, CISO and other CIO's	

Table 4 CIO responsibilities at the Rijksoverheid

According to the responsibility themes of the departmental CIO in table 4, we can observe several similarities to the public sector CIO responsibilities of Lawry & Waddell [46] and the priority list of NASIO [47]. However theme's as digital transformation, digital government, cloud and data were clarified in the responsibilities of the departmental CIO, these themes seems to be less prominent in counterpart of the study of Lawry & Waddell and NASIO. In addition to the CIO responsibilities of the departmental CIO, a high emphasis for portfolio management can be concluded.

The primary responsibility of the CIO at the Rijksoverheid is to control the IT function efficiently. However, as the importance and appliance of IT during projects rise, the CIO evolves in having advising and strategic responsibilities. Responsibilities we can derive from the CIO profile were: conduct and align IT strategy, raise awareness and train policymakers in terms of IT, portfolio management, manage architecture, raise awareness about security and organize governance.[6] *In compareship of the public sector CIO responsibilities of Lawry & Waddell* [46] *and the priority list of NASIO* [47] *a smaller emphasis on digital transformation, digital government, cloud and data can be observed. However, the departmental CIO profile has a higher emphasis towards portfolio management in contrast of the public sector CIO responsibilities.* [6]

2.3 Roles of the CIO

In the previous paragraph (responsibilities), we recognized the CIO holds responsibility in the domains business, IT architecture and IS service models.[48] Furthermore, we observed a stake in digital transformation, leadership, IT governance, actionable data, and competitive advantage.

According to these domains and responsibilities, several roles could be declared in order to comply.

As the role of CIO matures or the importance of information within the organization increases according to Ross & Feeny, there is a closer relationship with business units, influencing the business strategy, seeking for innovation in the marketplace and has a strong vision on IT-alignment, which improve organizational learning and CIO credibility. In the early stages of CIO maturity, the CIO is focused on the functional aspect of IT and is following/operating in terms of business strategy. [49]

Related to the efficiency and the effectiveness of the CIO and its role in the organization, Mclean and Smith claim that the CIO has a different focus of attention (role), depending on the business environment. Mclean and Smith make a distinction in efficient and stable environments were the CIO is possibly a technologist or enabler, and effective environments were the CIO fulfills the role of innovator either strategist. (figure 5)

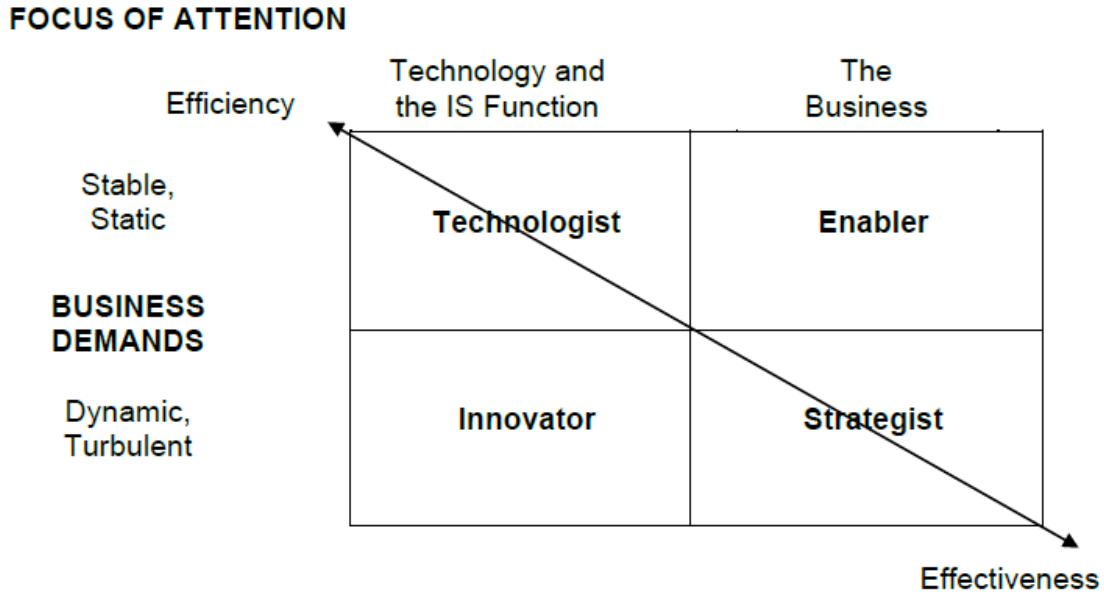


Figure 1. The Business–IS Framework

Figure 5 CIO leadership roles[50]

Interpreting the model of Mclean & Smith (figure 5) we can derive four main leadership roles:

- **Technologist:** Advices business managers regarding cost-effective technology projects to improve the information system and the business.
- **Enabler:** Informs and advocates user community's to use information systems optimally.
- **Innovator:** Strives for leading-edge IT technology to optimize current processes and supports an environment of experimentation and innovation.
- **Strategist:** Makes sure the business is aware of IT possibilities and provide support, shows leadership and initiative in new business initiatives.

[48] Ross, J., & Feeny, D. (1999). The Evolving Role of the CIO.
[49] Chun, M. (2009). CIO roles and responsibilities: Twenty-five years of evolution and change.
[50] Smith, E. R., McLean, & J., S. (2014). Management, Leadership, and the Roles of the CIO.

Based on these roles the vertical dimension represents the business demands in terms of stable and predictive or dynamic and rapidly changing requirements. The horizontal dimension represents the primary focus of the Information system manager (CIO). Depending on the organization the CIO can be in charge of the efficiency of the information system landscape or the effectiveness.

> *Interpreting the CIO role from a business and IT vision perspective, the CIO has to develop close relationships with business units to influence the business strategy and build credibility.*[49] *Furthermore, depending on the business environment the CIO has to be a technologist, enabler, innovator or strategist in terms of business attention.* [50]

As Smith and Chun interpret the CIO role from a business and IT vision perspective, Maes has a more information structural view towards the role of CIO.[51] In the Amsterdam Information Model (9 square model) Maes defined several layers of the flow of information within a company which is displayed by the 9 squares in the figure. From top to bottom, we can determine the strategic information, which is structured and used for operations. By interpretating the model from right to left, data is produced by technology, in the middle this data is used as information and a communication method and finally at the left data is used for business knowledge. (figure 6)

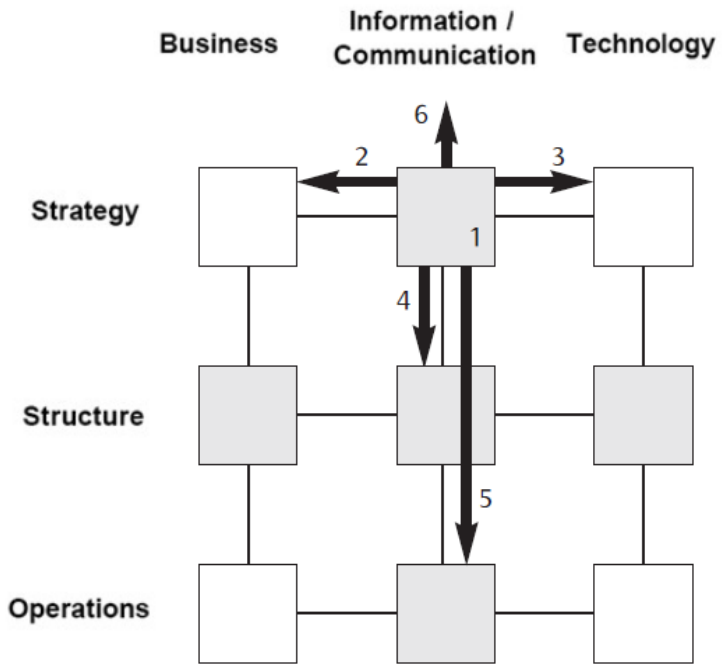


Figure 6 Amsterdam information model according to CIO roles of Maes[51]

In addition to the flow of information, Maes conducted the role of CIO in this process. Defined by the six arrows in the figure which holds the following roles:

1. Information strategist: Central to this role is the outline organization of information management and taking control of information strategy and take responsibility for business requirements and ICT opportunities. Exploiting information as a business asset is crucial.
2. Co-creator/advisor business strategy: The CIO is co-defining and co-structuring the strategy of the business, according to the intensive of information for the organization, the CIO advices or co-creates in the establishment of the business strategy.

[51] Maes, R. (2007). An Integrative Perspective on Information Management.

3. IT portfolio manager: Is maintaining relationships with ICT providers and keep in control of performance, costs and future developments in the market.
4. Enterprise Architect: Develop and ensuring a flexible and scalable architecture covering the 9 squares of the model in terms of information.
5. Business advisor: The success of a CIO depends on the relationship with business managers and his coordinating power. Together these skills assist in redesigning business processes, training, developing business cases.
6. Trend watcher: The CIO keeps himself informed about trends and assesses their value.

Maes concluded the roles of CIO from an information management perspective [51] which includes a business element (advisor business strategy), IT architecture element (Enterprise architect), IS service element (Business advisor and trend watcher) and leadership ability (information strategist and IT portfolio manager)

Digitalization and technical innovation changing the nature of the CIO's job as we seen in the last decades. A study by Gartner reflected the change of the CIO role in the last years.[52] (figure 7)

The CIO role is changing	
From	***To***
IT-outcome-focussed	*Business-outcome-focussed*
Order- taking	*Collaborative agenda-setting*
Supporting	*Compelling*
Cost-controlling	*Revenue-building*
Process re-engineering	*Data-exploiting*
Sourcing	*Creating*
Function-focused	*Platform-focussed*
Seeking parity	*Seeking differentiation*
Within IT	*Everywhere*
IT-risk-focussed	*Business-risk-focussed*

Figure 7 CIO role evolvements [52]

As we summarize the outcomes of the Gartner study, we can conclude that there is a clear contrast between the old and the new profile. Mainly by the digitalization, which continues to advance, a more diverse supplier network and the development of economic growth models, which can attract new markets and customers by the use of IT the role of CIO, is derived by three main objectives:

- Accelerating and converging technology trends
- Shifting business expectations
- New corporate/organization objectives

[52] Gartner. (2018). Mastering the New Business Executive Job of the CIO.

As we already concluded in the CIO definition section, the CIO had to overcome drastic changes during the last decades. [46]As we described the CIO roles mainly from business and information perspective. [51]The last years the CIO role is according to Gartner focused towards business, Revenue-building, Data-exploiting, Platform-focused and IT is everywhere in the organization in order to achieve active participation. [52]

CIO roles in the public sector

The CIO role in the public sector is facing different challenges than the role in the private sector. One of the differences is the evolution from technology leader to govern policies, focus towards enterprise environments and the reporting structure.[53]

A study performed by the National Association of State Chief Information Offices (NASCIO) of the USA, states that the primairy responsibility of the public sector CIO is concentrated towards the infrastructure functions. However, public sector CIO's have to deal with the same challenges as in the private sector occurs, namely the quick evolvement of technology, disruptive forces and a new generation of customers.[54]

The NASCIO stated in relation to the role of CIO that leadership is an essential driver of success. As in the US public sector, CIO's have to report to heads of Finance, Administration, Budget or the Governor. Only 30% has the authority to report to the Governor directly. As a result, most CIOs have a policy-setting authority and executive authority, but not managerial and decision authority.

To strengthen their role and influence, NASCIO stated that leadership is a crucial role in success and enablement.

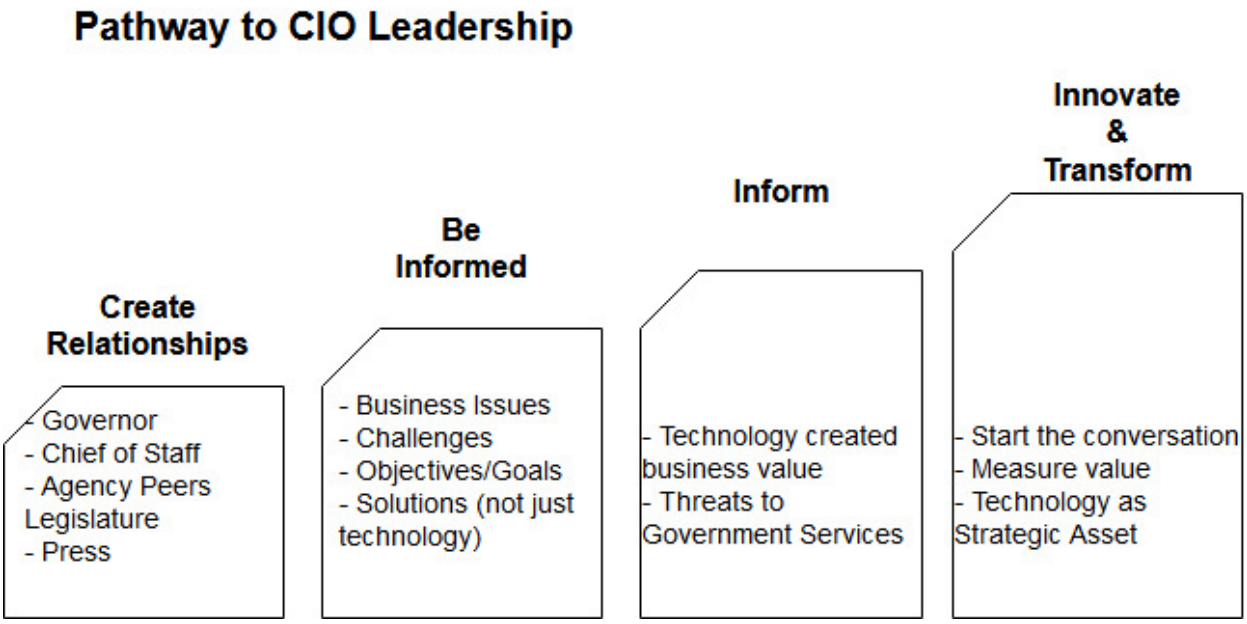


Figure 8 Pathway to Public Sector CIO leadership[54]

As we can observe the leadership curve is starting by creating relationships with the Governor towards a better alignment and strategic position for the use of IT and finally measured value and technology as a strategic asset.

[53] NICOLESCU, C., & BERCEANU, B. (2014). The leadership role of a local public administration CIO: the case of Bucharest. Theoretical and Applied Economics Volume XXI, 141-156.
[54] NASCIO. (2011). State CIO Leadership in Government Innovation and Transformation. 13.

Lawry and Waddell conducted another research in terms of the roles of CIO in the public sector and concluded the following roles: [55]

- Manage staff
- Education of IT in Business context
- Technical competiveness & Awareness
- Strategic planning
- Business transformation
- Governance, policies and procedures

We can suggest that the role of CIO in the public sector according to Lawry and Waddell is quite simlair to the private sector, expect for environmental influences such as: more risk averse, reliance on rules & procedures, less freedom to react naturally and less flexibility. However, Lawry and Waddell explains that the role of CIO in the public sector is fast evolving due the importance of ICT.

> *As we observe the CIO role from Public Sector perspective, we can conclude based on the studies of NICOLESCU & BERCEANU[53] Lawry & Waddell [55] and NASCIO[54] that policies and reporting structures obtain a crucial stake in the Public Sector environment. According to Lawry & Waddell [55] the role of CIO is quite equal to their private sector counterparts. However, NASCIO [54] declares a crucial focus towards leadership and managerial authority as CIO roles.*

CIO roles at the Rijksoverheid

As the departmental CIO within the Rijksoverheid can be either a role or function, and the fact that the organizational approach of the CIO is free of interpretation, we haven't found an compulsive set of roles according the CIO. Furthermore, the CIO has the option to delegate responsibilities to their supportive CIO office. The roles we can distinguish from the CIO profile were [6]:

- Member and IT advisor of the ministry board
- Portfolio manager and project controller
- IT project advisor

[55] Lawry, R., & Waddell, D. (2007). CIOs in the Public Sector: Their Roles,Responsibilities and Future.

2.4 CIO positioning

In the previous paragraph (roles of the CIO), the environment and the credibility of the CIO influenced the focus attention and the main role the CIO is performing. Also Leadership structure influenced the ability of the success of the CIO.

According to Gupta[56] the development of the CIO position was similar to the CFO position evolvement. As the CFO position was introduced as a modern competitive pricing, cash flow and economical weapon to gather competitive advantage and make quick decisions on executive/board room level. The CIO was introduced when information technology was recognized as a highly valuable competitive advantage weapon. According to Gottschalk the role of CIO and other executives were introduced by the growing complexity of manufacturing to oversee operations and respond on rapid changes and business competition. [57]

In private sectors, the CIO works closely together with the CEO to get approval by suggested IT projects and outline the IT-related business strategy elements. In this case the relationship and the aimed strategy of the CEO plays a critical role in the performance of the CIO.[56] Furthermore, the CIO reports to the CFO as well in terms of financing IT-projects and assets. Difficult in the CIO job is the responsibility for multiple resources but offers in some ways lack of visible or measurable value. [57]

The CIO has to build relationships with line managers, which report to the CIO as well. The strategic role of the CIO is quite complex regarding the fact that there are several organizational and structural possibilities to fulfill the role. [57]

Because the position of CIO's can differ and the relationship with other executives determines the performance of the CIO, we can relate five categories, which influence the status, position, and the IT management performance of the CIO[58]:

- Control assumption – Who is in charge of the IT direction?
- Centrality assumptions – How central is IT aligning in the business strategy?
- IT skill value assumption – What is the value of IT skills at different levels?
- Justification assumptions – Justification of IT investment
- Beneficiaries assumptions – Who benefits by the use of IT?

In the Private sector, the CIO is positioned close to the CEO to respond rapid on changes in the field of business competition.[57] *Also to oversee operations the CIO has a crucial role. However, the CEO plays a vital role in the performance of the CIO.* [58]

CIO positioning in the Public sector

In terms of CIO positioning in the public sector, there is not much research available. The GAO concluded in 2001 that there is no specific format according to the positioning of the CIO. Unless there is no specific format, they formulated six principles according the CIO-function[59]:

- Admit the importance of information management when realizing organizational goals.
- The CIO-function need to be positioned at administrative level.
- Create support, acceptation, trust and authority in the organization.
- Measure and publicize performance indicators
- Align ICT-services in terms of organizational goals.

[56] Gupta, Y. P. (1991). The chief executive officer and the chief information officer: the strategic partnership . Journal of Information Technology '91 vol 6, 128-139.
[57] Gottschalk, P., & Taylor, N. (2000). Strategic management of IS/IT functions: the role of the CIO. Proceedings of the 33rd Annual Hawaii International Conference on System Sciences.
[58] Kaarst-Brown, M. L. (2005). Understanding an organization's view of the CIO: The Role of Assumptions of IT. MIS Quarterly Executive vol 4. June 2005, 287-301.
[59] Rekenkamer. (2008). Lessen uit ICT-projecten bij de overheid; Deel B.

Another research of the GAO in 2004 concluded the challenges of CIO's were according to 80% of the participants[55]:

1. Implementing effective ICT-management
2. Access to relevant business and sector resources.
3. Communication and collaboration internal and external of the organization
4. Managing change

Furthermore, the NASCIO conducted a research according the authority of the US public sector CIO and concluded that the reporting structure and positioning of governmental CIO's in the United States differ.[60] As NASCIO concluded in terms of authority, 50% of the CIO's have authority over a Department, Office or Agency solely responsible for IT services. Remaining indicated a variety of reporting structures including Finance, Administration, Budget and the Governor. In terms of report 30% report directly to the Governor, were 20% report to cabinet level positions and 50% to a non-cabinet level position.

> *As we have seen in research in the private sector, the reporting structure and relationship with top management influence the success of the CIO.* [61]

CIO positioning at the Rijksoverheid

According to the fact that the departmental CIO function is free for interpretation within ministries, the departmental CIO is positioned as a function either a role. In terms of a function, the CIO ultimately performs the function of CIO. When the CIO is described as a role, the CIO is combing the CIO responsibility besides a primary (management) function.

The following table represents an overview of the ministry, the number of CIO staff and the combined role either function of the CIO.[62]

Ministerie	Number of employees supportive CIO office 2012	Function or combined role CIO (situation of 2012)
Algemene Zaken (General Affairs)	4	Directeur Bedrijfsvoering (director of operations)
Buitenlandse Zaken (Foreign Affairs)	12	DG Consulaire Zaken en bedrijfsvoering (DGCB), tevens plaatsvervangend secretaris-generaal (DG Consular Affairs and Operations (DGCB), also Deputy Secretary-General)
Binnenlandse Zaken (Interior and Kingdom Relations)	5	CIO/Hoofddirecteur Dienst Concernstaf en Bedrijfsvoering (CIO / Chief Executive Officer of the Corporate Staff and Operations Department)
Defensie (Defence)	10	Function
Economische Zaken (Economic Affairs)	20	Function
Financien (Finance)	40	Function
Infrastructuur & Milieu (Infrastructure and environment)	3-4	Hoofddirecteur Financiën, Management en Control en directeur Bedrijfsvoering, Organisatie en Informatiebeleid (Chief Financial Officer, Management and Control and Director of Operations,

[60] NASCIO. (2011). State CIO Leadership in Government Innovation and Transformation. 13.
[61] Rajiv D. Banker, H. H. (2011). CIO reporting structure, strategic positioning, and firm performance.
[62] Aanpak van ICT door het Rijk 2012. (2012). De Rekenkamer.

		Organization and Information Policy)
Onderwijs, Cultuur en Wetenschap (Education, Culture and Science)	6	Directeur Kennis (CIO-beleid) en plaatsvervangend directeur Facilitair Management en ICT (CIO-bedrijfsvoering) (Director of Knowledge (CIO policy) and deputy director Facility Management and ICT (CIO operations)
Sociale Zaken en Werkgelegenheid (Social Affairs and Employment)	6	plaatsvervangend secretaris-generaal (Deputy Secretary-General)
Veiligheid en Justitie (Justice and Security)	15	plaatsvervangend secretaris-generaal (Deputy Secretary-General)
Volksgezondheid, welzijn en Sport (Health, Welfare and Sport)	4	Function

Table 5 Rijksoverheid position of the departmental CIO overview 2012 [62]

In terms of reporting structure, the CIO profile of 2016 determined some minimum requirements in case of reporting from the CIO. [63]

- The departmental CIO holds responsibility for implementing and compliance of guidelines and frameworks from the CIO council. However, the CIO has to raise input and best practices as well to the CIO council.
- The departmental general director (DG) has final responsibility of (IT) projects. The CIO has to streamline and gain an overview in the project portfolio in dialogue with the DG.
- The departmental secretary general (SG) is responsible for resources, information, real estate and examines the performance. However, the CIO is responsible for the information coordination and the quality aspects of information.
- The Chief Information Security Officer (CISO) coordination information security and the safety of the information resources.
- The departmental CIO gives approval for IT projects over €5 million. And assess the project in terms of organization, costs and risks. For these projects, there will be a second check in terms of project design, risks and feasibility. (BIT)

A graphical representation of the reporting structure (RP represents the reports the CIO delivers in figure 9).

[63] Rijksoverheid. (2016). Profiel departementale CIO-organisatie

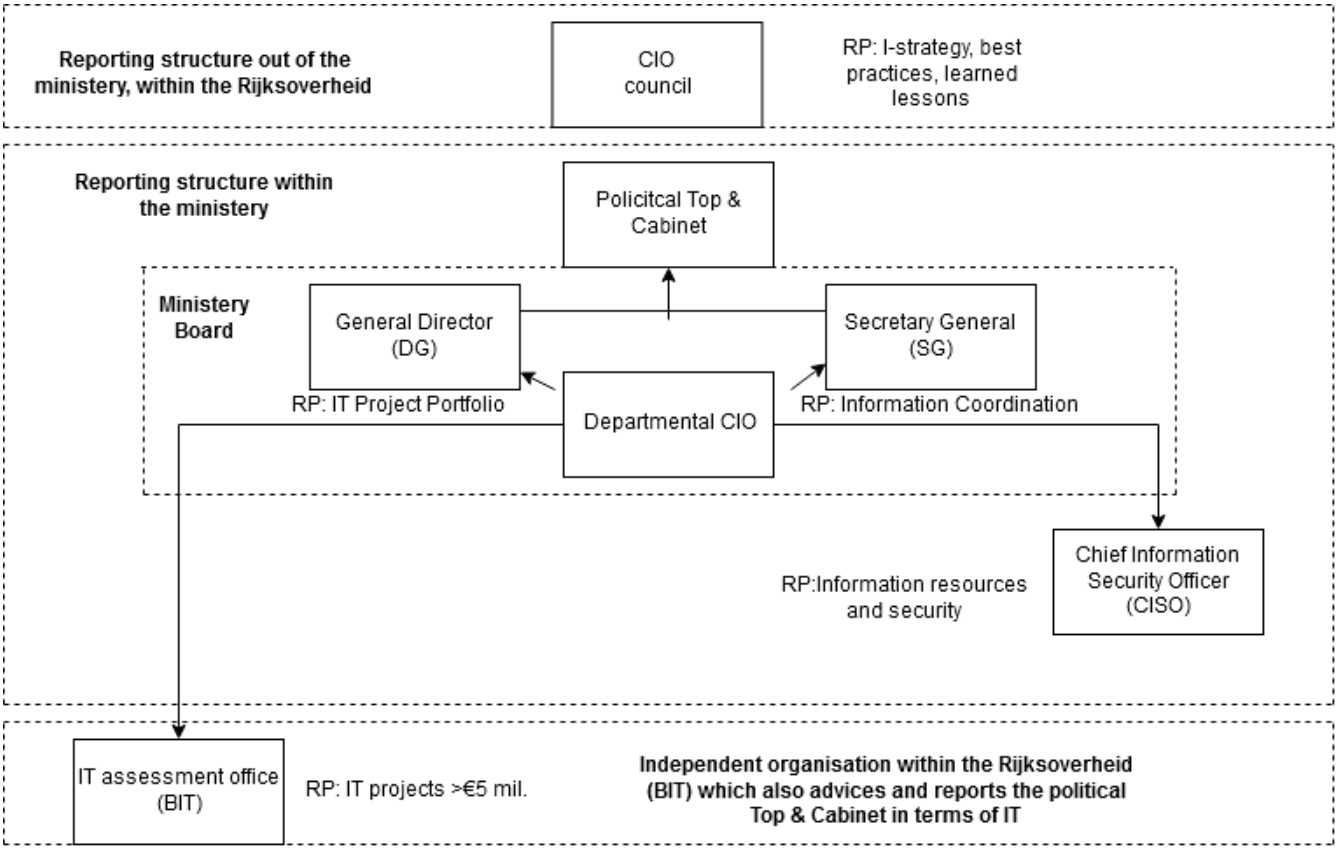


Figure 9 Rijksoverheid CIO reporting structure [63]

Within the Rijksoverheid the positioning of the departmental CIO depends on several factors. Such as role vs function and influence of the supportive office.[63] *As we've derived from the CIO profile of 2016 and the graphical representation the CIO has the following reporting responsibilities:*

- *The CIO reports in terms of project portfolio to the General Director (DG).*
- *The CIO reports in terms of information coordination towards the Secretary General (SG).*
- *The CIO reports in terms of information resources and security to the CISO.*
- *The CIO reports IT projects over 5 million euro's towards BIT.*

2.5 IT Governance

IT governance is the establishment of structures, relationships, processes and mechanisms with the aim to develop direct and control IT strategy and resource allocation to achieve the goals and objects of an enterprise. [64] As described in previous paragraphs, the responsibilities, roles and position are crucial for the credibility, authority and success or the CIO. IT Governance deepens the organizational structure of the CIO's strategy, relationships and reach of information technology within the organization.

IT governance is usually a responsibility of executive management. IT governance encompasses the IT strategic plan and formalizes the IT decision-making structure in the organization. [64]

Six key assets in organizations, which needs to be governed to create value according to Weill: human, financial, physical, intellectual property, IT and relationships. Top performing enterprises seek value from IT in several ways[65]:

- Clarify the aspect of IT in business strategies.
- Manage the money spent on IT and measure the value which is derived from the use of IT.
- Organize responsibilities and accountability in order to arrange organizational change in order to implement new IT capabilities.
- Become more knowledgeable and experienced by each implementation and share IT assets.

As Campbell describes IT governance as encompassing the IT strategic plan and the IT decision-making structure. According to Weill [65] IT governance is not about decision management, but more about who systematically makes and contributes to the decisions to accomplish a vision. Good governance designs allow enterprises to deliver high results on their IT investments.

By structuring relationships, processes and mechanisms used to develop, direct and control IT strategy, goals and objectives of the organization can be accomplished. [64]*Good IT governance design allow enterprises to deliver high results on their IT investment.*[65]

Effective IT governance needs to be analyzed by determining who and how decisions are made in critical domains related to IT such as: principles, infrastructure, architecture, investment and prioritization. These domains are highly inter-related but firms often have different governances according to each domain.[66]

IT governance domains:
IT principles: High-level statements about the use of IT within the firm.
IT infrastructure: Description of building and extending the IT foundation of the firm.
IT architecture: policies and rules for the use of IT and a migration path between the business and IT.
IT investment and prioritization: Describes the prioritization and decision-making process for IT investments.

In the average firm governance was not designed to align with IT. In better performing firms there is a significant alliance between business strategy and IT principles. As we observe the stress factors in firms which are not evolved towards an IT aligned approach we can determine that often investments in IT were only performed by approval of top managers and IT decisions, mechanisms and complex governance made it difficult for top managers to see IT in a transparent manner. A remedy for these stress factors in terms of IT governance should solve the company's governance design and determines who is responsible for the IT principles.

[64] John Campbell, C. M. (2009). PUBLIC AND PRIVATE SECTOR IT GOVERNANCE: IDENTIFYING CONTEXTUAL DIFFERENCES. Australasian Journal of Information Systems.
[65] Weill, P. (2004). IT Governance "How Top Performers Manage IT Decision Rights for Superior Results".
[66] Weill, P. a. (2002). Don't Just Lead, Govern: Implementing Effective IT Governance.

Governance Mechanisms				
Mechanisms	***Objectives***	***Desirable Behaviour***	***Undesirable Behaviour Observed***	***Positively Correlated With Performance Metric***
Executive Committee	*Holistic view of seamless business including IT*	*Seamless IT management*	*IT ignored*	*Growth, Market Cap, Productivity*
IT Councils	*Senior management involvement and education in gaining business value from IT*	*Involvement and alignment*	*Abdication by senior management*	*Margin,ROA. Productivity*
Architecture Committee	*Identify strategic technologies and standards-enforcements?*	*Business driven IT decision making*	*IT police and delays*	*Margin Growth, Market Cap, Productivity*
Capital investment approval and budgets	*Separation of proposal and approval*	*Prudent IT investing*	*Paralysis by analysis*	*ROA, Productivity*
Service level agreements	*Specify and measure IT service*	*Professional supply and demand*	*Manage to SLA not business need*	*ROA*
Chargeback	*Recoup IT costs from business*	*Responsible use of IT*	*Arguments about charges and warped demand*	*ROA*
Process teams with IT membership	*Take process view using IT (and other assets) effectively*	*End-to-end process management*	*Stagnation of functional skills and fragmented IT infrastructure*	*ROA, Productivity*

Figure 10 IT governance mechanisms[66]

Figure 10 displays frequent used governance mechanisms in business environments and describes their desirable behavior when well managed or undesirable behavior when poorly managed.

As companies have different views on the role of IT (cost item vs strategic enabler), it is difficult to determine a static approach for the appliance of IT governance. However Well and Woodhem described a framework for the appliance of IT governance in figure 11.[66]

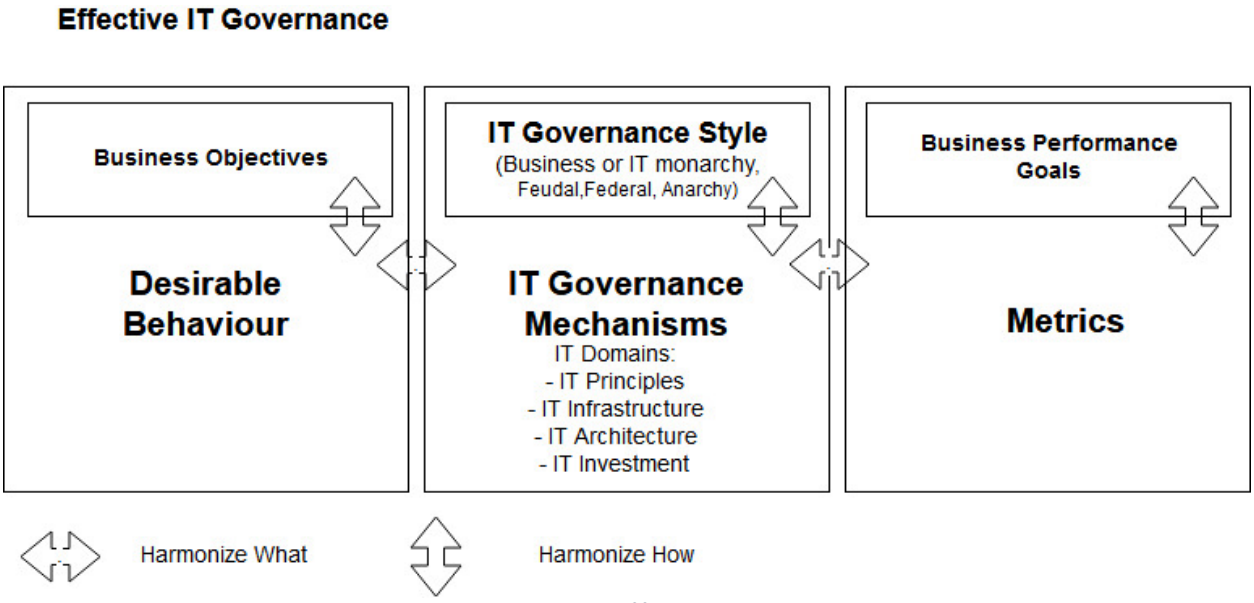


Figure 11 three steps in establishing IT Governance[66]

As we interpret figure 11 we see the first phase (business objectives), which is in fact the goal, or objective of the use of IT and can be seen as desirable behavior.

The second phase of this model is the IT governance style or governance mechanism as seen in the previous table. Depending on the mechanism, we can derive productivity, growth or ROA by the use of IT. When the governance style is set, IT domains can be shaped.

The last phase is to measure the business performance of the IT governance structure.

IT Governance can be equipped within the organization by describing the desired behavior of IT. Followed by selecting a suited governance mechanism and define structures and priorities in the IT domain section. Ultimately, IT governance needs to be measured to optimize the value of IT and observe effective goal setting. [66]

Public sector

In private sectors often, the senior management is responsible for implementing governance structures that provide efficacy of investment decision-making processes. However, in public sector organizations accountability is more complicated by a set of relationships between public service, government and the parliament. At the same time in the public sector ongoing changes occurring which relate to the country's economy and its citizens. [64]

In addition, the NASCIO defined IT principles (high-level statements about the use of IT within the firm) for IT Governance in the public sector. [67] (figure 12)

[67] Nascio. (2018). State CIO as broker: A new model.

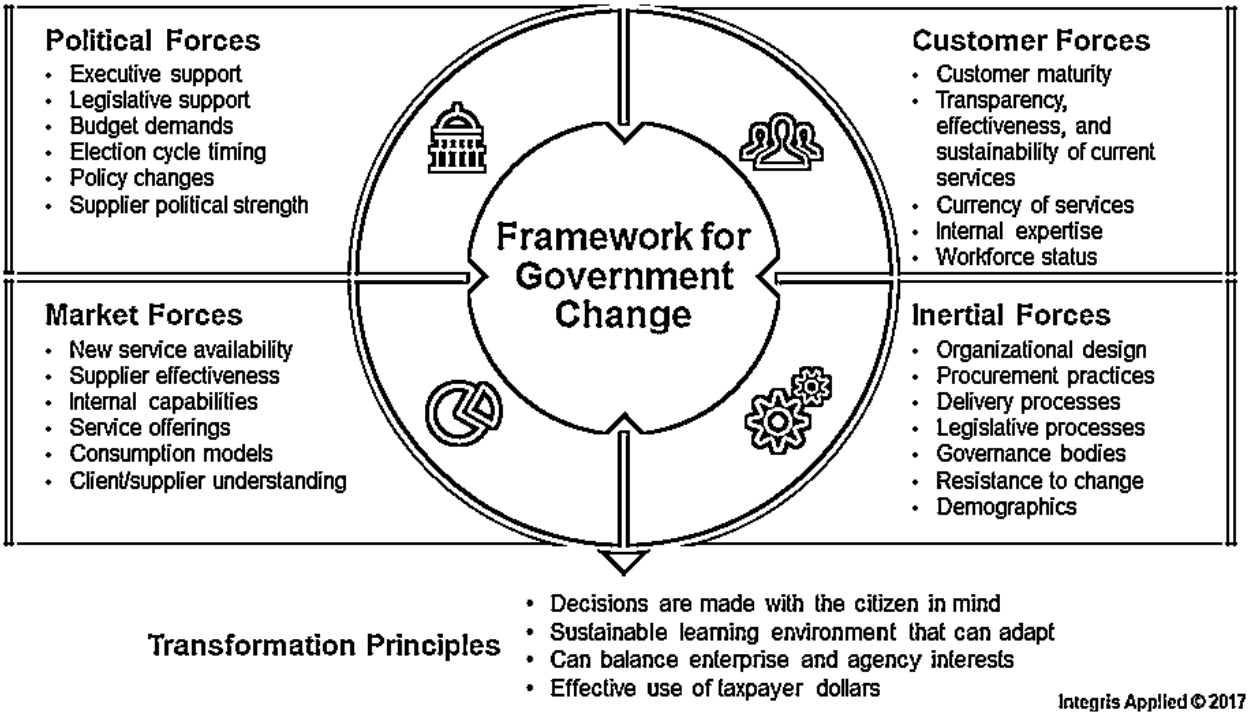


Figure 12 Public sector IT governance artifacts [67]

IT governance in the public sector is often complex by a set of relationships between public service, government and the parliament, which makes accountability often unclear. At the same time, ongoing changes occur in terms of the country's economy and citizens.[64] *However, according to the NASCIO we can derive four main domains of IT principles for the public sector (political forces, customer forces, market forces and inertial forces) which can be used as a foundation to build IT governance in the public sector.* [67]

IT governance at the Rijksoverheid

Because the role of CIO at the Rijksoverheid is introduced with the focus on control of IT projects. The general governance which is available is concerned towards the management of IT projects and portfolios (internally known as "portfolio management guide")[68]. Furthermore, the Rijksoverheid develops a strategic IT agenda, which holds high over strategic objectives for the appliance of IT. [69]However, there is no specific overview or insight how departmental CIO's have organized and governed their IT properties excluded from the (departmental) I-agenda.

[68] CIO RIJK. (2018). Handboek Portfoliomanagement Rijk voor projecten .
[69] Strategische I-agenda Rijksdienst. (2017).

2.6 CIO maturity

CIO maturity holds the future development potential of the CIO in the areas of responsibilities, roles, position and IT governance.

Maturity models describe the phases through organizations, processes or systems evolve. According to predefined levels, a state of the organization or system can be determined. Moreover, logical progress or "maturity" can be defined to improve their capabilities and/or enhance their performance. [70]

CMMI (capability maturity model integration) is a framework which holds a set of characteristics of organizations, which have successfully implemented process improvement. These criteria can be used to optimize organization processes. When interpreting CMMI models, it is essential to consider the overall context. [71]

As the CMMI model is a general representation conducted out of five levels. CMMI model levels can be interpreted as following.[72]

Identifier	Capability level
0	Incomplete
1	Performed
2	Managed
3	Defined
4	Quantitative Managed
5	Optimizing

Table 6 CMMI maturity levels [72]

As there exist many maturity models, their aim is to assist organizations. However, by the difference in interpretation, it can be difficult for organizations to choose the right maturity model. [73]

As our research is focused towards the responsibilities, roles, position and IT governance of the departmental CIO within the Dutch central government. We aim to consult maturity models, which fits the scope of this research.

Gartner Digital Government Maturity model

The Gartner Digital Government Maturity Model perceived the level of maturity in terms of digital government program and digital transformation. The objective of this model is to assist CIO's in understanding the key dimensions of digital government and knowing the capabilities of digital government. As this model is a general representation in terms of digital government maturity, including several factors of digitalization. We just focus towards the CIO leadership section of this model (fourth line figure 13). [74]

[70] Clark, t., & Jones, R. (1999). Organisational Interoperability Maturity Model for C2.
[71] CMMI Product Team. (2002). Capability Maturity Model Integration (CMMI) Version 1.1. Carnegie Mellon.
[72] CONSTANTINESCU, R., & IACOB, I. M. (2007). CAPABILITY MATURITY MODEL INTEGRATION. Journal of Applied Quanttitative Methods vol 2 no1 spring 2007.
[73] Looy, A. v., Backer, M. d., Poels, G., & Snoeck, M. (2012). Choosing the right business process maturity model.
[74] Maio, A. D., Howard, R., & Archer, G. (2015). Introducing the Gartner Digital Government Maturity Model. Gartner.

	E-Gov.	Open	Data-Centric	Fully Digital	Smart
Maturity Level	1 Initial	2 Developing	3 Defined	4 Managed	5 Optimizing
Value Focus	Compliance, efficiency	Transparency and openness	Constituent value	Transformation	Sustainability
Channel Strategy	Portal	Government as a platform	Nongovernment channels	Truly multichannel	Automation replaces portals
Leadership	CIO/CTO	CDO	Departments	CIO and departments	(New) CIO
Technology Focus	SOA	Open data, open service	Open any data	Things as data	Smart machines
Sourcing Strategy	Mixed	Re-insourced, cloud first	Multisourced	Partner-sourced	Outsourced
Key Metrics	% services on line	% open data	Number of data-driven services	% data from things	% decrease of services

Figure 13 Digital government maturity stages[74]

Level 1 – Initial
in this level, digital government is not really a concern and the digital organization is mainly driven by a portal which is measured in terms of numbers and accessibility of online services. The CIO is closely related to the CTO or is performing CTO tasks as well in terms of strategy.

Level 2 – Developing
Digital government becomes a concern, mainly driven by senior political leadership, increasing availability of data and shifting user behaviors. In terms of CIO leadership Chief Digital Officer roles and/or Chief Data Officer responsibilities become more exposed to guide the transformation towards digital government and manage the amount of available data.

Level 3 – Defined
The focus on data becomes predominant as data-based services emerge and in terms of leadership bottom-up activities occur to centralize a data-driven approach. The CIO remain responsible for legacy processes and applications. In addition, the CIO lead/support data centricity principles that drive innovation and transformation. As data is crucial, it's also up to business people to identify innovative use of data.

Level 4 - Managed
The importance of a data-centric approach is fully recognized, opportunities and innovation on the use of data take place and data is crossing agency boundaries. In terms of IT strategy related to the CIO, legacy processes and applications get replaced by data driven services. And data will be leveraged across external partners such as banks and employees.

Level 5 – Optimizing
Digital transformation is the norm and innovation processes become predictable and repeatable. The CIO has a greater and renovated role as the master of information and data. Which includes to make digital transformation business as usual, prepare for smart machines (AI) in key business processes and establish a portfolio which is concentrated towards business value for data.

The Gartner Digital Government Maturity model describes digital government maturity. As the model starts with level 1 which implies "there is no concern towards the digital government" and the CIO is performing technical/strategical tasks. Followed by level 2 where the CIO develops a digital and data-centric approach. Level 3 is where the CIO remains responsible for legacy processes, but drive innovation and transformation were data becomes more crucial. Level 4 is where the CIO has a strategy to replace existing services for data-driven services and eliminates legacy processes. In level 5 the responsibility of the CIO is to become a master of information and data. In this stage, the CIO has to prepare for smart machines and establish a portfolio which is concentrated towards gathering business value from data. [74]

This model could be used to assess the CIO in digital government maturity perspective.

Organization's maturity of information leadership capability

According to Peppard, Edwards and Lambert [75]the role and the maturity level of the CIO depend on the organization environment. And is determined by two main influencing factors, namely:

- The chosen business strategy and the importance of competitiveness in their environment.
- Level of information capability within the organization.

However, the study of Peppard,Edwards and Lambert[75] *describes a few scenario's where the CIO started as a utility IT director whom is focused towards the IT infrastructure and evolved over the years towards an evangelist CIO who adds value to the business in terms of IT. Later on followed by becoming an innovator, which identified new enabling business opportunities. And evolved towards a CIO stated as "facilitator" who puts these IT values in places in the organization and culture. Finally, the "Agility IT director" makes no need for the CIO role, where the CIO works as someone who is responsible for the IT supply.*

This model could be used to assess the CIO in agility leadership perspective.

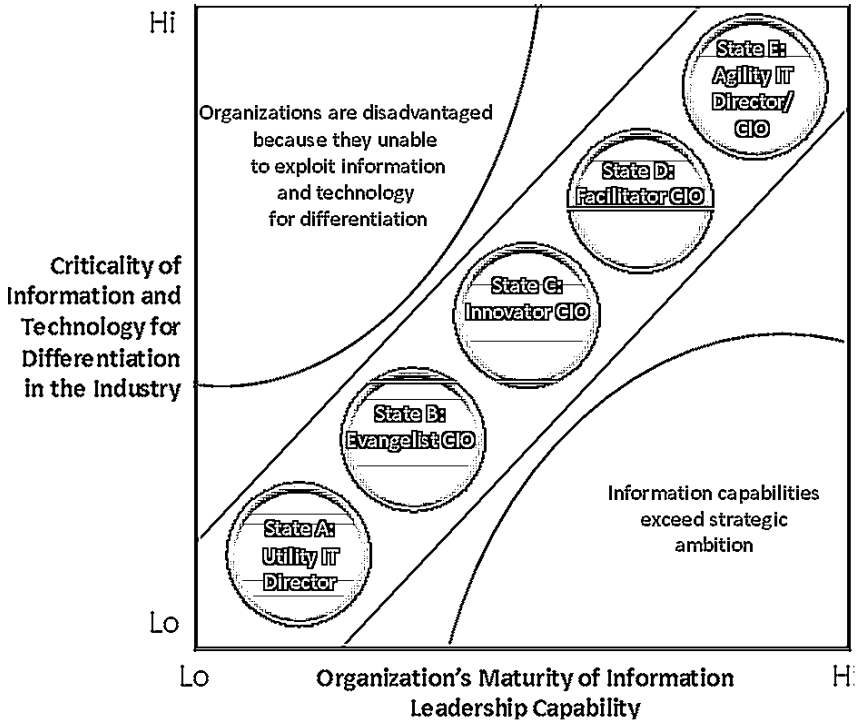


Figure 14 organization's maturity of information leadership capability[75]

[75] Peppard, J., Edwards, C., & Lambert, R. (2011). Clarifying the Ambiguous role of the CIO.

Characteristics and detailed information of the maturity stages can be found in the appendix.

IT organizational model

The IT organizational maturity model of Garter performed by Nielsen[76] describes the enabling capabilities of IT to meet diverse technologies to the entire enterprise. As an IT leader must design and evolve the IT organization to meet foundations and achieve overall strategic outcomes. In this model stages will be discussed how IT meet the demands of the enterprise. In relationship with the CIO this maturity model implies levels of the strategic priority of IT within an enterprise and describes several steps for CIO's to raise the priority within the business organization.

Level 1: Functional
At this level, enterprises view IT as a commodity and a necessary cost. The enabling factor of IT is recognized in the necessary task of automation. Within this scenario IT has a functional liability which concentrates towards it's own operational efficiency, most likely measured by cost.

Level 2: Enabling
In this stage enterprises expect IT to enable and improve back-office business operations. CIO's are not engaged in business planning, and focus on basic relationship management roles and rudimentary project management.

Level 3: Contributing
IT is proactive, collaborative in the enterprise operational environment, and measured in terms of performance. Leaders work together but remain separate accountability in delivering benefits from IT investments.

Level 4: Differentiating
At this level, enterprises seek to dominate their industry, where IT is strategically employed as a differentiator for crucial value propositions. Boundaries between IT and other technology-centric organizations such as R&D or manufacturing have broken down.

Level 5: Transformational
Enterprises redefine markets, industries and competition at this level. IT is an innovative engine. In This level the CIO becomes a chief operational official, chief strategist or strategic change officer for the entire organization.

In appendix 2 related priorities for CIO's were declared which can help in these maturity levels to enhance the value of IT within the organization.

The IT organizational model describes levels according to the enabling capabilities of IT. In level 1 IT is seen as a commodity and a necessary cost for the business. Followed by level 2 were CIO's are not engaged in business planning and IT is primailry improving back-office operations. Level 3 is where the value of IT is measured and CIO's work together with other leaders and were responsible for delivering benefits from the use of IT. In level 4 IT value is strategically employed as key value proposition. And finally in level 5 IT is an innovate engine where CIO's become COO, chief strategist or strategic change officer. [76]

This model could be used to assess the CIO's strategic influence perspective.

As we interpreted three maturity models from CIO perspective, we can conclude that each of these three models hold each a specific perspective. As stated in the introduction, maturity models holds a general representation formulated in several levels[71]. Based on these three models we can conclude that the Gartner Digital Government Maturity model (first model) is focused towards the digital transformation capabilities of the CIO.[74] The Organization's maturity of information leadership capability (second model) is focused towards the leadership capabilities of the CIO, but kept in mind this model it's effectivity depends on the business environment.[76] Finally the IT organizational model

[76] Nielsen, T. (2017). Renewing the IT Organizational Model Primer for 2017. Gartner.

is focused towards the strategic alignment and organizational enabling factor of IT, where the CIO is staged in strategic influence and enabling factor.

2.7 IT Value creation

The CIO has a crucial role in ensuring that IT is deployed as a strategic asset and the Information system function delivers value. [77]As Earl & Feeny states, when the Information system function won't add value, it determines if the organization sees IT as an asset or a liability.

The return derived from investments in information systems often disappoints or is not apparent. While there is a body of literature available to facilitate the successful outcomes of information systems. A factor, which can cause disappointments in information system projects, is the focus towards timely delivery of a technical artifact instead of a benefit realization approach. [78]

In business setting, we can suggest that several IT project managers get rewarded in terms of completing information system projects in time, by specifications and within budget, which does not automatically mean that the project delivery real benefits to the organization.[79] Also, project management methodologies such as PRINCE2 has the indentation to focus on delivering a product (technical artifact) and paying less attention to the business benefits. [80]

According to Doherty[78], several public sector organizations experienced with the appliance of benefit planning in IT projects. A few of the main outcomes were:

- Business cases are management speak and hard to realize during later project phases.
- Benefits are difficult to measure and take ownership of.
- Even if there is a clear picture of begin- and end state of the project, there is a big gap about what goes on in between.

One of the conclusions of Doherty was to focus on business change instead of documentation, create a framework to define benefits and enrich success factors by a more explicit benefits realization orientation.[78]

According to Serra[81] Benefit Realization Management (BRM) contributes in realizing the aimed business strategy and contributes to better project management performance.

The CIO has a crucial role in ensuring that IT is deployed in a strategic asset and delivers business value. [77]*However, the return derived from investments in information systems is not always obvious.* [78]*As project management, methodologies such as Prince2 often focus on product realization. Business benefits were often overseen.*[80]

IT value in the business environment

Hitt & Brynjolfsson[82] stated the value of IT for business by three different measures. Namely productivity improvements, business profitability and consumer value. In the research of Hitt & Brynjolfsson is suggested that there is a significance for productivity improvements and consumer value, but these two values will not always result in business profitability.

In a more recent study performed by Tallon, Kraemer & Gurbaxani[83] we see four types of ways IT can add value to the business according to executives. Namely: unfocused, operations focus, market focus

[77] Earl, M. J., & Feeny, D. F. (1994). Is your CIO adding value?
[78] DOHERTY, N. A. (2012). Factors affecting the successful realisation of benefits from systems development projects: findings from three case studies.
[79] Sauer, C. &. (2010). Information Systems Failure. Encyclopaedia of Library & Information Sciences.
[80] Markus, M. (2004). Technochange management: using IT to drive organizational change. Journal of Information Technology, 4-20.
[81] Serra, C. E. (2015). Benefits Realisation Management and its influence on project success and on the execution of business strategies. International Journal of Project Management, 53-66.
[82] Hitt, L. M., & Brynjolfsson, E. (1996). Productivity, Business Profitability, and Consumer Surplus: Three Different Measures of Information Technology Value. MIS Quarterly Vol. 20, No. 2 (Jun., 1996), 121-142.
[83] Tallon, P. P., Kraemer, K. L., & Gurbaxani, V. (2015). Executives' Perceptions of the Business Value of Information Technology: A Process-Oriented Approach. Journal of Management Information Systems Volume 16, 2000 - Issue 4, 145-173.

and dual focus. In addition, management practices such as strategic alignment and IT investment evaluations enhance the levels of IT in the business value.

The role of the CIO in IT value business creation is partly dependent on the CEO's vision towards IT according to Earl & feeny.[77]

IT value in the business environment is derived from productivity improvements, business profitability and customer value. [82]*By describing a focus, perform strategic alignment and IT investment evaluation business value by the use of IT can be derived.* [83]

IT value in the Public Sector

According to Chircu & Hae-Dong Lee [84], IT value in the public sector is evaluated and derived in economic value and political value. Where economic value takes place by cost reduction and increased efficiency relates political value to the information accuracy, equal access and social benefits.

Emmerson [85] declares Social Return on Investment as terminology to address IT value for the non-profit sector. Social value reflects the activity that leads to the improvement of the lives of individuals and the community. Which could be accomplished in terms of greater access to services and great public moments. Social value is difficult to quantify in money. It is more about the primary motivation.

In terms of the public sector, Socio-economic value is a combination of economic value and some aspects of social value on non-profit work and the impact on its clients.

Social Return on Investment (SROI) compares the projects net benefits to the investment, Scenario's which can be addressed by the SROI method can relate to:
"What is the impact for the business by this investment?"
"What type of public costs can be eliminated?"

IT value in the public sector is declared in economic value (cost reduction & increased efficiency) and political value (information accuracy and social benefits).[84]

IT value at the Rijksoverheid

A recent study in order of the ministry of BZK (Interior and Kingdom Relations) [86] described the effect of social cost and benefit analysis for the value creation of the digital government. According to this study, the aim of IT investments is to add value in social context and be sure society funds were spent attentively in terms of recognizing value.

The Rijksoverheid describes the value which can be derived from IT as social benefits.[86]

[84] Chircu, A. M., & Lee, D. H.-D. (2003). Understanding IT investments in the Public Sector: The Case of E-Government.
[85] Emerson, J. (2000). Social Return on Investment. Making waves vol 11. no 2.
[86] Koopmans, C., Benthem, M. v., & Hulsker, W. (2018). Werkwijzer voor maatschappelijke kostenbatenanalyse van de digitale overheid.

2.8 Summary and Conclusions Theoretical framework

In the CIO environment, we have distinguished seven central themes in order to perform our research. As the CIO definition states the introduction of the CIO role and the evolution over the years which hold the CIO rationale as what it is nowadays. In addition to the definition, CIO responsibilities, CIO roles, position and IT governance evaluate the profile of the CIO in three main domains namely general interpretation, Public sector interpretation and available literature within Rijksoverheid context. Finally, CIO maturity assesses several growth models, which is ultimately optimizing the value of IT within the organization.

CIO definition

The Chief Information Officer (CIO) was first declared in the 80's by Syncott and Gruber[26] as a senior executive responsible for establishing corporate information policy standards and takes management control over all information resources. Halfway the 80's information systems became strategically involved, which resulted in operational alignment of information systems to support business goals and competitive advantage by the use of information. During this evolution, the role of CIO became strategic, managerial and competititve advantage oriented. [28] Which developed the CIO in an executive role during the 90's[31]. As during end of the 90's and 00's technology evolved in a quick phase[35], the role of CIO these days is matured in a quick responding executive who can manage change and stay ahead of competitors. [46]

As private sector companies and public sector organizations function quite similar in terms of IT management[39], there can be derived some differences according to the CIO definition in the public sector environment.

According to Lawry & Waddell [46] more bureaucracy, less flexibility, a more substantial amount of rules and risk aversion, defines the CIO environment in the public sector in contrast to their private sector counterparts.

CIO responsibilities

Feeny and Willcocks defined four domains of responsibilities of the CIO, namely Business and IT vision, Design of IT Architecture, Delivery of IS Services and leadership. More recently we see responsibilities occur as business intelligence, business transformation, customer care and internet and e-business [41]

The CIO of today do not see themselves as "techies" but their worldview is strategic. Mainly by the strategic focus, governance of IT and the management of mixed resources.

As we observe the responsibilities of the CIO keeps expanding. Mainly by keeping up with the competitive environment, increasing value of information and growth of digital capabilities.[41] As a result of this growth in responsibilities, we see some companies that introduce the CDO role which is in charge of digital change and outfacing digital capabilities.

In the public sector we can conclude that the responsibilities of the CIO are quite similar to their private sector counterparts, however according to the responsibilities of the Rijksoverheid CIO and public sector CIO, there is a greater focus on Security/Risk management and Consolidation/Optimization. [6] [47]

CIO roles

As the role of CIO matures in terms of business and IT alignment within the organization, we can observe a greater extent of roles in terms of business, strategy and innovation. In contrast when the CIO is less involved in the business and just performing functional tasks concerning IT. [6]

According to Mclean and Smith, the CIO fulfills four roles in the business environment, namely: Technologist, Enabler, Innovator and Strategist. Depending on the business environment, the focus and priority of these four roles can differ. [50]

In the Amsterdam Information model Maes describes the flow of information within an organization and has conducted a version with the roles of CIO in this manner.[51] Maes concluded that the CIO has to be an information strategist, Co-creator business strategy, IT portfolio manager, Enterprise Architect, Business advisor and Trendwatcher.

In the public sector, the CIO has to deal with the same challenges as quick environment changes, disruptive forces and a new generation of customers[60]. However, policies, reporting structure and a focus towards the internal organizationhas a high priority in the public sector CIO environment. [53]

Leadership is a crucial role element of the public sector CIO, primarily because of the policy creating and reporting structure.[60] In a study of Lawry & Waddell[46] similar roles as in the business environment were defined, such as strategic planning, business transformation and manage staff.

CIO position

The role of CIO was introduced when information technology was recognized as a highly valuable competitive advantage weapon. In order to make quick decisions and rapid response on business competition, the CIO works closely together with the CEO. [57]

Besides the relationship with the CEO, the CIO has to build relationships with line managers, which report to the CIO as well. Kaarst-Brown[58] determined five categories which influence the status, position and the IT management performance of the CIO. Control (who controls IT), Centrality assumptions (alignment of IT in business strategy), IT skill value assumption (IT skills among different levels), Justification assumption (justification IT investments), Beneficiaries assumptions (who benefits by the use of IT?).

The reporting structure and relationship with top management influence the success of the CIO.[61] We can derive from the profile of the departmental CIO 2016 [63] the formal position of the CIO in Rijksoverheid context. According to the profile, the CIO is situated in the ministry board were the CIO works closely with DG and SG. However, the SG is the highest ranked civil servant in the ministery, this person often has to work closely togheter with ministers and follow political orders from the parliament (cabinet) via the minister.

IT Governance

IT governance is the structure, decision rights and accountability[65] to direct and control IT strategy within an organization and gain results from IT investments[64]. IT governance can be interpreted in four main domains[66]:

IT principles: High-level statements about the use of IT within the firm.
IT infrastructure: Description of building and extending the IT foundation of the firm.
IT architecture: policies and rules for the use of IT and a migration path between the business and IT.
IT investment and priorization: Describes the priorization and decision-making process for IT investments.

In organizations were IT governance is well organized we see alignment of the IT principles with business strategy. In private sector organizations, often the senior management is responsible for implementing governance structures. In public sector organizations, accountability is more complicated by a set of relationships between public service, government and the parliament. At the same time in the public sector ongoing changes occur in terms of economy and its citizens. [64]

In terms of IT governance principles we can conclude four domains especially for the public sector: political forces, market forces, customer forces and inertial forces.[67] The Rijksoverheid publishes each year a strategic I-agenda, which holds general IT principles. Besides the general I-agenda, departments publish their own I-agenda. Furthermore, in terms of IT investments and priorization the Rijksoverheid has set a portfolio management approach for CIO's which holds guidelines in IT project decision making processes.

CIO Maturity

Maturity models exist out of predefined levels, which describe the state of an organization or system.[70] By assessing the level of maturity, it is essential to understand that it is a general representation, which could be used for improvements. [72]

As our research focused towards the roles, position and IT governance of the departmental CIO within the Dutch central government. We aim to consult maturity models, which fits the scope of this research and discuss three maturity models, which can be related to these characteristics.

Model 1: The Gartner Digital Government Maturity model[74] describes digital government maturity. As we interpret this model from a leadership/CIO perspective, we can conclude that this model is focused on the rise of digital transformation and value creation.

Model 2: The Organization's maturity[75] of information leadership capability model describes the CIO from agility perspective where the CIO is creating an innovative environment where the CIO is finally a facilitator. This model effectiveness is highly dependent on the business environment.

Model 3: The organizational model[76] describes the maturity of the CIO from positional and alignment perspective. In fact, we can conclude according to this model the growth of the strategic IT function of the CIO within the organization.

As maturity models hold a general representation defined by several levels of maturity.[72] We have found three maturity models which could help us to assess the potential growth of the CIO in terms of Digital government maturity[74], agility leadership[75] and the strategic influence within the organization. [76]

IT value creation

The CIO has a crucial role in ensuring IT is deployed as a strategic asset and the information system function delivers value[77]. We see that frequent used management methodologies focus on delivering a product and focus less on business benefits.[80] By prioritizing product delivery, business benefits are hard to take ownership of or realize in later project phases.[78]

In business organizations, IT value is derived in terms of productivity improvements, business profitability and customer value.[82] In the public sector organizations, IT value is assessed in terms of its economic value (cost reduction) or political value (information accuracy, social benefits).[84]

2.9 Research Gap

During the literature review, we concluded that there is a significant amount of research available about the definition, responsibilities, roles and IT governance of the CIO in (private) organization context. However, the position of the CIO is quite a briefly discussed subject.

As we observe the CIO from public sector perspective, we can conclude that several sources identify the definition, resources, roles and Public sector governance artifacts of the CIO in the public sector. The position of the CIO in the public sector is often discussed in terms of “reporting and policy structures”.

The responsibilities of the Rijksoverheid departmental CIO is currently described in terms of minimal responsibilities. Which relates to the IT-strategy, portfolio management and I-governance. But is missing out on upcoming trends such as change management, digitalization and the appliance of data within primary processes.

The roles of the departmental CIO at the Dutch central government is described very briefly and shortly. As some responsibilities relate to roles, these responsibilities can also be delegated to staff members. However, the current role profile is missing out on important elements of CIO roles several research sources concludes such as leadership, IT strategy alignment and IT value creation within the organization.

In terms of positioning, we have discovered information about the Rijksoverheid departmental CIO function and supportive staff members of the CIO office at the Dutch central government. However, this information is outdated and missing elements, which were discussed in public sector position research such as reporting structure, policy creation authority and relationships with top management, CIO office and line management.

IT governance is an instrument to derive value from IT. We see according to the research of NASCIO several high-level artifacts for IT governance. At the Rijksoverheid we found artifacts described in several I-strategic agenda’s. However, we have found minimal information in managing IT governance in terms of the departmental CIO. Such as deriving desirable behavior, used IT governance management mechanisms and the use of metrics.

As we elaborate further on the profile of departmental CIO within the Rijksoverheid, we have not found (recent) studies in terms of departmental CIO maturity within the Rijksoverheid and their growth potential. As we have discovered that the role of departmental CIO within the Rijksoverheid is mainly introduced as a control function for IT projects, we want to assess what the key definition of departmental CIO holds nowadays. Which results in the following main research question:

“What are the Roles, responsibilities, position and IT governance of the departmental CIO at the Dutch central government (Rijksoverheid) and its growth potential in terms of maturity?”

Chapter 3. Method

The third chapter of this thesis presents the methods, which were performed during the qualitative phase of this study. In the previous chapter, relevant literature was addressed in order to define research gaps and describe the CIO environment. The methods described in this chapter build upon the literature review in terms of research strategy and forms the foundation of the result section described in chapter 4 of this study.

3.1 Research strategy

In this research, we assess the current profile of the departmental CIO within the Dutch central Government. As there is many research availible according to the roles, responsibilities and future developments of the CIO function in (private) organizations, there is a less extent of research available for the CIO in public sector context, and specifically for the CIO of the Dutch governmental Governement.

In addition, we want to determine CIO properties in aspects of multiple perspectives (responsibilities, roles, position, IT governance, maturity). In this sense qualitative research emphases multiple perspectives and is a process of building a holistic picture of a phenomenon. [87]

When investigated previous studies in the field of "roles and positioning of the CIO at the Rijksoverheid" we aim to investigate the current situation of the CIO profile at the Rijksoverheid.

3.2 Research design

In order to follow up the research strategy[88] , six process steps were conducted in defining a qualitative research approach. (figure 15)

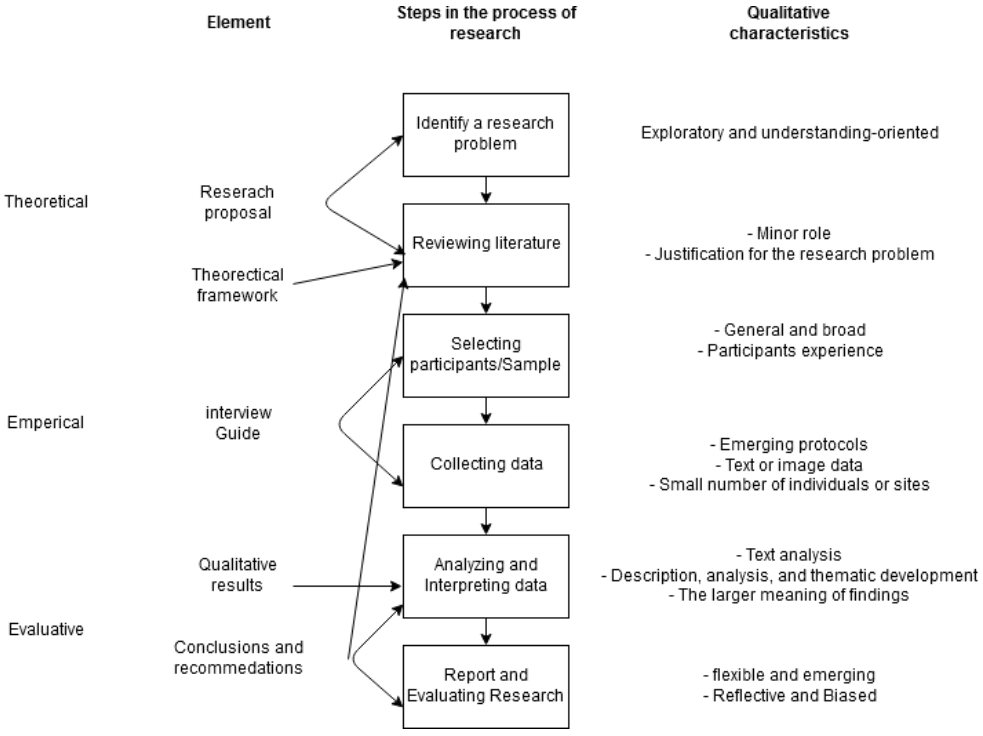


Figure 15 six process steps in qualitative research[88]

[87] Abawi, K. (2008). Qualitative and Quantitative Research.
[88] Creswell, J. (2002). Educational Research: Planning, Conducting and Evaluating Quantitative and Qualitative Research. Prentice Hall.

As Creswell (figure 15) describes the steps in the process of research from a general perspective, in the following section each step is characterized and defined in relation to the scope of this study.

Theoretical steps

Step 1 – Identify a research problem
During this phase existing literature is evaluated with the aim to understand and explore current findings of the CIO environment. Concluded during this phase is that there exists a great deal of research on the CIO function in the private sector. However, there is a smaller amount of studies, which examines the CIO function in the public sector and Rijksoverheid context. Based on the existing gaps and uncertainties in this research domain, the research proposal is defined.

Step 2 – Reviewing Literature
At this phase, related literature according to the research scope of this study was characterized. Furthermore, this literature review served as a foundation for the interview guide and as a point of reference to the discussion section.

Empirical steps

Step 3 – Selecting participants/sample
When the research problem was grounded by related literature and gaps were revealed according to the research scope, research questions were refined and an interview guide was established to build upon existing literature and clarify uncertainties in the research area. By selecting participants in the field, missing information was gathered and described in the result section (chapter 4).

Step 4 – Collecting data
Before the data collecting phase was started, the intended interview guide was reviewed among fellow experts in the field in terms of clarity and relevance. When the interview guide was supposed to be clear among experts, data could be collected among selected participants. Data was collected in a semi-structured interview setting based on questions of the intended interview guide, where an audio device was used to record the interviews.

Step 5 – Analyzing and Interpreting data
The analyzation of the interpreted interview data starts to transcribe and type out the recorded interview audio files. Besides the interpretation of the spoken text, the tone of voice can be an important measure as well. The transcripts were interpreted and structured via coding. According to frequent emerging codes in the transcripts, results were conducted and established.

Evaluative steps

Step 6 – Report and Evaluating Research
When interview data was analyzed, and founding's were conducted, results were discussed in perspective of the literature review (chapter 5). Finally, a conclusion (chapter 6) raise an answer to the intended research questions and holds recommendations for future research.

3.3 Participant selection

By approaching CIO's in the early stage of this research and inform about this study, we aim to speak all departmental CIO's.

In situations where we were not able to contact or speak to the CIO, we aim to contact the subsidiary CIO of the ministry.

In the following table (table 7), an overview is conducted of the ministry and number of CIO office employees.

Ministery	**Number of CIO office staff in 2012**
Algemene Zaken (General Affairs)	4
Buitenlandse Zaken (Foreign Affairs)	12
Binnenlandse Zaken (Interior and Kingdom Relations)	5
Defensie (Defence)	10
Economische Zaken (Economic Affairs)	20
Financien (Finance)	40
Infrastructuur & Milieu (Infrastructure and environment)	3-4
Onderwijs, Cultuur en Wetenschap (Education, Culture and Science)	6
Sociale Zaken en Werkgelegenheid (Social Affairs and Employment)	6
Veiligheid en Justitie (Justice and Security)	15
Volksgezondheid, welzijn en Sport (Health, Welfare and Sport)	4

Table 7 Number of CIO office staff in 2012 [4]

As the Rijksoverheid counted in 2019 12 ministries. The ministery of Landbouw natuur en voedselkwaliteit (Ministry of Agriculture Nature and Food Quality) could be added to the list which makes it a total of 12 ministeries. In this study we have spoken to 11 CIO's and 1 subsidairy CIO.

3.4 Qualitative data collecting method

The theoretical frameworks sets the foundation for the theoretical part of this study and clarifies the gaps and non-existing theory. Furthermore, it deepens concepts and clarifies specific key elements. In addition to the theoretical framework this study performs an empirical phase.

As the aim of this research is to examine the role, position and IT governance of a departmental CIO within the Dutch central Government. Comprehensive interviews with several CIO's and in exception subsidiary CIO's were conducted in order to extend views and evaluate findings based on the existing literature.

To collect data from selected participants an interview guide in a semi-structured manner was established. Other manners for conducting interviews were structured or unstructured interviews. In case of structured interviews, answers were mainly short and approving or disapproving, while is semi-structured interviews answers can be raised by arguments and become more specific. [89] Unstructured interviews can be challenging to manage when multiple participants were asked upon their opinion, regarding the fact that unstructured interviews allow any direction and topic suggestion to be raised. In areas were nothing is known yet, unstructured interviews can be helpful.

Another frequent used qualitative data collection method is the appliance of focus groups. Focus groups are dynamic groups, which generate qualitative data. [90]Focus groups can be used to challenge current findings or elaborate and define new ideas. As this study mainly examines the viewpoint of a role, position and organization. We want to declare and observe mainly parts of the current functioning and operation.

3.4.1 Interview Guide

The interview guide is a way to have ensured that the same general areas of information were covered during multiple interviews. This provides more focus in a set of multiple interviews then a conversational approach. [91]

3.4.2 Multiple perspective

In addition to the interview guide, multiple perspective interviews help to interpret the research questions from different viewpoints and arguments by several individuals. These individuals can relate to each other as members of the same groups. Multiple perspective interviews help to establish mutual influences and difference in sense making. As interviews were conducted in a 1 on 1 setting it gives the participants more freedom to react naturally. [92]

When conducting a qualitative research study a few steps have to be taken:
- In-depth reading and development of themes which consist on identifying consistency, individual conceptual profiles and a code tree.
- Selection of individual accounts which belong to the same relational unit.
- Compare individuals to their relation with other respondents. By codes we can determine regularities or identify patterns.
- When individuals relate to the findings of the group we can invent their contribution to the central themes, by setting a code. If there is a difference in fouding, we expend the coding scheme.

When interpreting multiple perspective outcomes, often five types of outcomes were found:
- Same story, same meaning: participants use the same words and stories. These results can be seen as convergent.
- Same story, different interpretation: hybrid between convergent and dissonant. Content converges, but interpretation diverges.

[89] Zorn, T. (2008). Designing and Conducting Semi-Structured Interviews for Research. Waikato Management School.
[90] P.Gill. (2008). Methods of data collection in qualitative research: interviews and focus groups.
[91] Turner, D. W. (2010). Qualitative Interview Design: A Practical Guide for Novice Investigators.
[92] Vogl, S., Zartler, U., Schmidt, E.-M., & Rieder, I. (2017). Developing an analytical framework for multiple perspective, qualitative longitudinal interviews (MPQLI).

- Missing pieces: Information which is provided by a few participants which is necessary to understand the entire story and which is missed out by other participants.
- Unique information: refers to information which is provided by one participant, but is not necessary to understand the full picture.
- Illuminating accounts: different but not conflicting whith the founding of other participants.

3.5 Data analysis & quality attributes

As the previous paragraph describes the methods, in order of the qualitative aspect of this study such as interview, interview guide and multi perspective. This paragraph holds the methods concerning the analysis of the founded results during the qualitative phase of this study.

3.5.1 Interview Transcription

During the collecting data phase, selected participants will be approached and interviewed according the interview guide format. During these interviews, audio is recorded via a mobile recording device and have to be transcribed into written form for closer interpretation.

During the transcription, data needs to be judged and interpreted in terms of manner and verbalization.Representation of audio and visual data into a written form is the first step in analyzing data. [93]

As the transcript of the interview is finished and if there is any misunderstanding or difficulties in interpretation, the selected participant will be contacted for clarification.

3.5.2 Analysis of interview data

The analysis of the interview data is retrieved from the transcripts of the interviews. When interviews transcribed into verbalized form, these transcripts will be used for analyzation and several scripts together form the foundation of the interpetated results of the empirical phase.

A method of analyzing transcripts is coding specific elements of the interview and founded results. During the coding process data get's organized and sorted by labels which allow to summarize and synthesize occurrences in the data. This is the founded basis for the analysis. A well presented set of coding labels should represent the storyline of the interview.

Codes can occur in several types of forms (words, expressions or phrases). In the use of coding for analyzing interview data we can distinguish a few types of code[94].

3.5.3 Qualitative data analysis (coding method)

Coding is a method for separating, sorting and synthesizing qualitative data by labels and segments of data. Also known as attaching labels or segmenting data. During the application of coding based on the grounded theory practice, several crucial steps were performed:
- Continuous analysis of the data collection.
- Defining analytic codes and categories from data, not based or derived from a hypothesis.
- Constant comparative method
- Enhancing theory development during each data iteration/after newly collected data.
- Memo-writing to track the progress, define categories and relations between categories.

By these steps, grounded theory helps to generate a skeleton of the transcript. By the continuous improvement of the codes, the coding exists at least out of two main phases:
1. Initial phase: Naming crucial words, lines or segments by attaching a label to the collected data.
2. Focusses phase: Naming just the most relevant code to describe the data and organize larger amounts of data.

[93] Bailey, J. (2008). transcribing, First steps in qualitative data analysis:. Family Practice, Volume 25, Issue 2, 1 April 2008, 127-131.
[94] Center for Evaluation and Research. (2012). Tips & Tools #18: Coding Qualitative Data.

3. Theoretical coding: is developed by the focused phase and pinpoint the most noticeable categories in large batches of data.

Example of the coding phases:

Coding process

Raw data	Initial coding	Focused coding	*Theoretical coding*
Q. What did you take into account when you decided to buy this new technology?	Deciding to buy based on cost, reliability	**Seeking out evidence**	*The process of making sense of evidence and construction of knowledge*
What did we... we looked at cost, we looked at reliability and we sort of, we compared a few different types, talked to some people that had them.	Talking to dental colleagues on internet sites	**Gathering and comparing peers' evidence to reach a conclusion**	
Q. When you say you talked to some people who were they?			
Some dental colleagues. There's a couple of internet sites that we talked to some people... people had tried out some that didn't work very well.	Comparing their experiences		
Q. So in terms of materials either preventive materials or restorative materials; what do you take in account when you decide which one to adopt?	Looking at literature		
Well, that's a good question. I don't know. I suppose we [laughs] look at reliability. I suppose I've been looking at literature involved in it so I quite like my own little research about that, because I don't really trust the	Doing my own little research		

Figuur 16 Coding phases in grounded theory[95]

Initial coding should remain open and spark the thinking of allowing new ideas to emerge. Focused coding is derived from most frequent codes and theoretical codes make to help to tell an analytic story.

Memo's will be used to keep track of the process, make notes of observations during the interviews and analyzing steps made in the focused coding process. Finally, the theoretical codes will be used to formulate and interpretate the results of the conduced interviews and transcripts. [96]

3.5.4 Validity and Reliability

Validity relates to the extent the researcher measures what is aimed to study and is concentrated towards the topic which is intended.

Content validity relates to the extent which the variable covers the topic or is declared by the current knowledge domain. [97] To conduct content validity we have linked the theoretical framework and the interview guide questions. In this way key concepts built upon the definitions existing in current literature.

Furthermore, this research holds internal validity by transcribing and coding each interview separate and if new terms occur add them to the pre-set codes. When necessary or emergent codes appear, these findings will be discussed in the analysis and/or discussion section.

[95] Sbaraini, A., Carter, S. M., Evans, R. W., & Blinkhorn, A. (2011). How to do a grounded theory study: a worked example of a study of dental practices.
[96] Charmaz, K. (2006). Constructing Grounded theory. London: SAGE publications.

[97] Heale, R. (2015). Validity and reliability in quantitative studies.

As internal validity relates to the degree results are indepent, external validity relates to the extent results of a study can be generalized. [98] To conduct external validity we've interviewed and selected several CIO's and members of supportive CIO offices from different ministries to gain an broad overview of the departmental CIO role within the Dutch central Government.

Reliability
In quantitative research, reliability relates to the replicability of the process and the related results. In qualitative research definition of reliability lies in terms of consistency.[99] According to Silverman constant data comparison and comprehensive data enhance the reliability of the process and results. [100]

In this research we perform constant data comparison by determine a code book and refining pre-codes in transcribing and analyzing interview data. By an interview guide we have a consistent and constant pattern towards we can interview and gather data from selected participants.

By the diversity of CIO's from several ministries we aim to gather a comprehensive set of data.

Futher the interviews will be recorded by an audio recording device and will be typed out and transcribed right after the interview took place.

Bias
According to Ziniel bias is the difference between interpretation and formulation of the answer during an interview and the truth. Bias can occur by unclear formulation of questions, the attitude, of the interviewer and by the respondent in terms of social favorable answers.[101]

To avoid question biases, guidelines for good questions will be used to clarify the questions of the interview guide. Furthermore, during the interviews the respondent would be ask to "think aloud" when answering questions. Finally, participants will get a copy of the transcript to validate the interview data and the transcript will be updated if there is any form of uncertainty.

In order to reduce bias from respondents[101], the participant have to be known about the importance of the research and has to feel comfortable when answering the questions. On our behalf we have to be free from any form of interpretation and have to observe the participant and give room to freely speak and argument the research questions.

3.5.5 Limitations
As the interviews were performed in Dutch, language differences can occur. Based on the fact that concepts in one specific language can be understood differently in another language. This is particularly relevant for qualitative research of the fact it is interpreted on words. A remedy which can reduce the language barrier is to explain (English) key definitions in a descriptive (translated) formulation during the data collection phase. [102]

3.6 Disclaimer
Because of the sensitivity of the conducted interview data and transcripts. The transcripts of this study will be anonymized. In following of the anonymization of the transcripts, these would not be published. [103]

[98] prochaska, f. (sd). Internal and External Validty. Opgehaald van San Jose State University: http://www.sjsu.edu/people/fred.prochaska/courses/ScWk240/s1/ScWk-240-Week-5-2nd-Set-Slides---Internal-and-External-Validity.pdf
[99] Leung, L. (2015). Validity, reliability, and generalizability in qualitative research.
[100] Silverman, D. (2009). Doing Qualitative Research. London: SAGE Publications.
[101] Ziniel, S. I. (sd). Avoiding Bias in the Research Interview. Department of Medicine, Harvard Medical School.
[102] Nes, F. v., Abma, T., Jonsson, H., & Deeg, D. (2010). Language differences in qualitative research: is meaning lost in translation.
[103] Tsai, A., Kohrt, B., & Matthews, L. (2017). Promises and pitfalls of data sharing in qualitative research.

As this research can be interpreted by participants as an assessment in terms of departmental performance or in terms of personal competences in terms of the CIO. We want to make clear this research is concentrated to the current departmental CIO environment.

Chapter 4. Research results

This chapter represents the results found during the qualitative data collection phase of this study, which consists of 12 departmental CIO interviews. The interviews were completed based on questions of the interview guide in appendix 3. Chapter 2 theoretical framework formed the foundation of these questions, and in chapter 3 information about the empirical procedure is described. As the interview guide hold seven main themes, we describe the results conducted during the interviews by each topic.

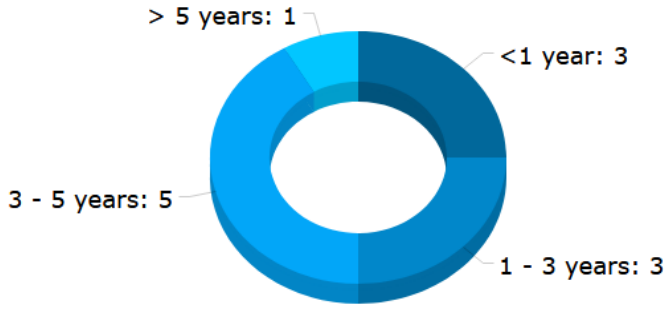
Some facts of the interviews:
- The interview which consumed the most time had a duration of 62 minutes, while the shortest interview took 29 minutes. Average interview time was: 42 minutes.
- Twelve ministries, were 11 CIO's has participated in this study and 1 subsidiary CIO.

This chapter hold results and quotes from the interview transcripts, entire interview transcripts include confidential information and would not be published.

4.1 Departmental CIO background

The first theme holds the background of the departmental CIO, which consists of the years working in their current CIO position and their previous working experience related to the CIO function.

CIO period
The CIO in RIjksoverheid context exists for almost ten years (introduced in 2008), the average CIO position fulfillment was ~3 years. However, there were 3 CIO's which were in this position for one year or less. And 1 CIO which was involved almost from the start (9,5) years. However, this person fulfilled the current CIO role for 4,5 years and a CIO role for another ministry in the past. (counted as 4,5 years). The CIO, which was positioned in this function for the most prolonged period, is currently working eight years in this function.



CIO quote… "I am 4,5 years CIO of this ministry, but 9,5 years CIO at the Rijksoverheid. Currently and previously combined with the function of pSG."

Figure 17 Results CIO period

Relevant professional background
Among the departmental CIO's, change program's and information management were frequently named as related professional background to the CIO function/role. While two CIO's specified change management as having experience in IT-driven change programs, another CIO told to have had previous experience in digital transformation regarding a crucial process of a ministery. Finally, one CIO told to have had fulfilled a change management study.

Information management: is another founding, which is several times named by the departmental CIO's as detailed professional background. CIO's involved in information management were involved in the information provision within the ministry, information supply for end users and the functional aspect of information. While one CIO has a professional background in information management consulting and finally a CIO told to have had a large stake of information management during the study period.

Financial professional background was declared three times. A CIO told to have municipality Financial experience, while another CIO told to have an economic-oriented university degree and another CIO is performing a finance-oriented position beside the role of CIO currently.

IT operations management: as related professional background was declared by three departmental CIO's, all three CIO's worked in a managerial oriented function at an operational oriented organization within Rijksoverheid context.

Ministerial business operations: is named by three departmental CIO's. Were all these three CIO's performed managerial or primary process-oriented functions in the past related to business operations within a ministry.

As we've discussed most frequent occurring relevant professional background outcomes, there were a few topics which were named by two CIO's as relevant professional background. Namely: deputy CIO, private sector experience, pSG as current relevant professional background and policy-oriented experience.Finally there were 8 topics declared once during the interviews, namely: Organizational scientist as study background, ministerial advisor, applied mathematics as study background, manager, operational automation, administrative (bestuurlijk) experience, service director (Directeur dienstverlening) and supervision (toezichthouder) experience.

A graphical representation of the founded results during the interviews and their related quotes is presented in the following table.

Relevant prof. background	**Frequency**
Change management	4
Information management	4
Finance	3
IT operations management	3
Ministerial business operations	3
Deputy CIO	2
Private sector work experience	2
pSG	2
Policy-oriented	2
Organizational scientist	1
Ministerial advisor	1
Applied mathematics	1
Manager	1
Operational automation	1
Administrative (Bestuurlijk)	1
Service director (Directeur dienstverlening)	1
Supervision (Toezichthouder)	1

CIO quote… "During my professional career, I've had to deal with a large proportion of information coordination and development. From the perspective of the user and the functional aspect.

CIO quote…" My previous experience of working at an operational oriented department was valuable to me"

CIO quote…" My IT experience is small and concentrated towards this ministry; however I have a rich imagination"

Table 8 Results relevant professional background of the CIO's

4.2 Departmental CIO roles

As the function/role of CIO for each department is free for interpretation, it appeared during the interviews that every CIO described the role/function of CIO differently. However, there were several points in common such as raising advice and being in control of the IT function.

CIO roles

The CIO roles section holds the roles which were declared by the CIO's during the interviews. While analyzing the roles, the CIO's told several contextual related information. However, in this result section we counted the roles the CIO described explicitly as a role or described as an essential task in their function.

Advisor: is a term which eight CIO's declared in their description of the departmental CIO role. Two CIO's claimed the term advisor as an understatement of the role of the CIO compared with top management as: "the CIO has an advising role in relationship to top management." While three CIO's specified the role of advisor as "has to raise advice on Information policies." And Three CIO's described the advising role in relationship with IT projects. As there were eight CIO's who declared to fulfill the role of advisor, two CIO's haven't named the role of advisor. And two CIO's commented the role of advisor. One CIO said, "the role of CIO was created from control and advising perspective. However, this is a limited perspective." And another CIO commented on the role as advisor in: "I am not an advisor, I am a partner in shaping and creating policies," however this CIO raised advice in terms of laws and regulations and opposed the role of advisor as formally known.

Controller: is by six CIO's declared as a role. Three CIO's said that the control role is mainly formally known as related to IT projects. However, these three CIO's prefer to raise advice in the early stages of IT projects. Two CIO's declared their role as a controller as being in control of subjects such as information security, portfolio management, and privacy. There was one CIO who said the control role as managing risks. Finally, there was one CIO who opposed the role of control as: "taking charge of IT portfolio management isn't fulfilling the CIO role to its full extent."

Guiding/coordinative: role is said by six CIO's. As we observe the topics were the CIO's guide and coordinate, two CIO's guide in projects. And four CIO's declared one specific item, the 4 specified topics were: raising priorities, coordinate strategy towards operations, guide information management and IT subjects within the primary process and finally coordinate and give guidance in the availability of data and existing IT projects.

Motivator: has occurred in the interview among six CIO's. Three CIO's declared the role of motivator related to innovation. Where three CIO's told to bring several people within the organization together to raise new idea's and innovative strength. One of these three CIO's described bringing a group of young employees from several primary processes together and formulate a narrative which can be discussed on higher level (bottom up innovation approach). One CIO described the role of motivator as giving empowerment to people to richen their network. One CIO as motivate employees in terms of widen the perspective in terms of IT. And two CIO's currently described to motivate employees in enrichen the possibilities of data via data ambassadors and data labs.

Formulating conditions (kaderstelling): is named by five CIO's. Where two CIO's declared that formulating conditions was related to their operational departments (uitvoerorganisaties). One other CIO explained formulating conditions as an important role of the CIO to check and note the IT function. One CIO proclaimed the role of formulating conditions without extra explanation. However, one CIO of these five CIO's admitted finding it difficult to balance these conditions (over regulated vs under-regulated).

Formulating policies (beleid formuleren): was described by four CIO's. However, these four have a different perspective on formulating policies. One CIO's described to be involved in the policies within the sector and focused upon policies of information security, information provision and privacy. One CIO explained that the focus of their department was not policy creation oriented but they formulated policies for internal use of the organization. One CIO explained the rise of information and the vital

stake of information in finding new perspectives for policymakers, where this CIO creates policies regarding the information household within the department. Moreover, one CIO said to formulate policies in terms of necessity. However, this could be observed at the intersection of creating and advising. There was one CIO who would like to be involved in sector and society policy creation, but remained it challenging to take on this role.

Auditing role (toetsend): Four CIO's declared an auditing role as CIO. Audits and raising advice is necessary in IT projects, were a three lines of defense approach should be favored in the future in terms of audits by an external party was raised by one CIO. Another CIO admitted that audits focused towards conditions is part of the CIO function. One CIO said that audits in the IT organization were beneficial to elaborate on further strategy and optimisation. And finaly one CIO said that audits were performed in terms of business cases before projects were approved.

Financial coordination: Three CIO's told to be involved in financial coordination. One CIO formulated the role of financial coordination in terms of managing the entire IT budget of the department. Another CIO said to steer along with the department in terms of financial priorities. Also, one CIO said that when large implementations and projects were launched, usually there is an IT component in this traject and IT has a crucial stake in the total cost of the traject. There was also one CIO who opposed in terms of financial coordination and told that cost approval for IT projects, was coordinated by the domain owner.

Overseer (toezichthouder): Three CIO's told that overseer is a role which they perform, however there was one CIO which said that overseer was the origin of the CIO role, but nowadays it is a limited perspective.

Primary process partner: Three CIO's said that it is essential in their role to be closely interwoven and alinged to the primary process.

Directive (regie): Three CIO's declared to have a directive role. Each CIO declared a different directive domain as: directive in the organization of stakeholders and organization, directive in policy implementation and supervision of the sector. Finally, the third CIO said to be directive in taking charge in the domain of digital capabilities of employees.

In addition, there were several roles which were declared by two CIO's. Partner in policy creation is one of those. One CIO said that he is partner in policy creation in the sector, where the other CIO is a director on the IT theme and being closely involved in setting priorities among policymakers. Also, the advising role towards policymakers (instead of partner in policy creation) was stated by two CIO's. However, there were multiple CIO's which raised the argument of advising policymakers, but putted less emphasis on this subject.

Other roles which were declared by two CIO's, were the role of communicator (bringing people of several domains together), information management (information strategy and by using big data and data mining to create a more predictable and reliable environment), supplier management, educative role (training of employees and middle managers), collaborative role, organizing pilots, facilitative role (facilitate employees in terms of their workplace and the availability of data).

There were four roles declared by one CIO. Namely: Owner of an IT organization, planning role, initiating role and decisive.

CIO role	Frequency
Advisor	8
Controller	6
Guiding/coordinative	6
Motivator	6
Formulating conditions(kaderstelling)	5
Formulating policies (beleid formuleren)	4
Auditing role (toetsende rol)	4
Financial coordination	3
Overseer (toezichthouder)	3
Primary proces partner	3
Directive (regie)	3
partner in policy creation	2
Policy advisor	2
Communicator (verbinder)	2
Information manager	2
Supplier management	2
Educative role	2
Collaborative role	2
Launching pilots	2
Anticipative role	2
Facilitatitve rol	2
Owner IT organization	1
Planning role	1
Initiating role	1
Decisive role	1

CIO quote…"The CIO role is absolutely an advising role in relation to the top."

CIO quote…" We have a role in coordinating and keeping track of projects and teams. Also, we stimulate and inform people to collaborate in terms of data."

CIO quote…" People do not fully realize the potential capabilities of information technology these days" (motivator)

CIO quote.." I am concerned with the information policies regarding information provision in the sector."

CIO quote…"As CIO, at first the role as overseer and advisor was predominant. But in my opinion these roles are limiting."

CIO quote…"I am convinced by the use of information management, big data and data mining we can make the world more predictable. And strengthen the decision making perspective as public organization."

CIO quote…" You can't be naïve in partnerships with suppliers. However, in digitalisation you can't be naive either."

Table 9 Results CIO role

CIO role in new technology perspective
This section holds the answers about how CIO's cope with emerging technologies. The first frequent answer "growing role of CIO" relates to the main answer to this question, where the other frequent terms relate to remedies the CIO's perform to deal with new technologies.

The growing role of CIO: Seven CIO's confirmed the continuous appearance of new technologies which enlargened the CIO role in recent years. Also, these seven CIO's elaborated in their answer various other factors which expanded the workload of the CIO role. Such as the number of laws & regulations and the growing complexity of information security.

Other foundings related to this question were: the CIO is not focused on technology, but focused towards information policies. Two CIO's raised the argument that dealing with new technologies was a task of the CIO office. And finally the last answers raised the argument that CIO's has to stimulate innovation withinin the organization itself and the CIO has to prioritize technologies to oversee them. One CIO did not elaborate on this subject.

As the main answer to this question is formulated in the "growing role of CIO" section, the following remedies were named frequent times.

Prioritizing: Five CIO's said to prioritize new technologies, in detail several prioritizing methods were raised among these CIO's. Such as focus upon relevance for the primary process of the ministry, operate a benefit analysis, right interpretation of the trend to distinguish trend from hype and evaluate the right moment of adoption.

Initiating: Three CIO's admitted having an initiating role in emerging technologies. Which relates to a directive attitude in initiating this technology in the organization.

There were four topics which were declared by two CIO's to describe the role of CIO concerning emerging technologies. Where two CIO's said to visit events, two CIO's said that the CIO has an innovative in bringing people together and stimulating a climate of emerging technologies. Two CIO's said that the CIO had to think and speak about policies in order to stimulate the adopting of new technologies and two CIO's said the CIO has a representative role towards the sector in terms of information technology.

Four topics emerged once during the interviews among the CIO's. One CIO said that their department is introducing a Chief Data Officer to strengthen the position of their data lab underneath the CIO role. Where another CIO said it is overflowing to introduce other roles besides the CIO. One CIO said to deal with emerging technologies by seeking possibilities in collaboration with the market (private sector). One CIO declared to were in organizational development in order to enhance their potential to deal with emerging technologies and their position in the sector.

CIO quote…"The workload of the CIO enlarges, however technology is not the single specific factor"

4.3 Departmental CIO position

This paragraph holds an overview of the positioning among departmental CIO's (function/role) and the number of employees their CIO office holds. However, the number of CIO office employees is not an indicator of ambition, by the fact that ministries differ in scale. Furthermore reporting structure and interaction with top and line management will be discussed in this section.

CIO function/role and CIO office scale
As some CIO's fulfill a function besides the position of CIO, the term CIO role is given. When a CIO is concerned towards CIO as a single role, the term CIO function is used. In the following overview the CIO role either function and the number of CIO office staff is presented.

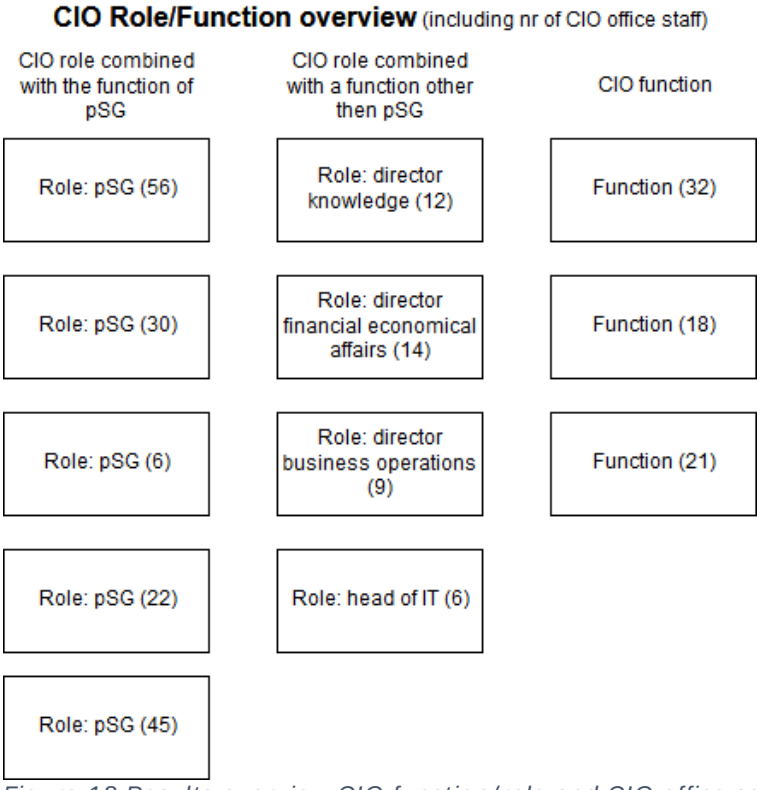


Figure 18 Results overview CIO function/role and CIO office scale

Additional CIO office organization information.
Throughout the interviews, the CIO's were asked upon the number of CIO office staff and to define the organization of the CIO office. Three CIO's explained the organization of the CIO office in a short manner, were eight CIO's defined the CIO office organization in more detail. The topic which was most frequent appearing concerned to the domain of information security.

Information security: Five CIO's actively mentioned that information security is an important subject within the CIO office and the CIO is supported on this subject by (several) IT security experts.

CIO office positioning: Three CIO's described the organizational position of the CIO office. Two CIO's described the CIO office position in relation to the business operations of the ministry. The third CIO which elaborated upon this subject declared the CIO office was positioned firmly to the purchasing department.

CIO – CIO office coordinator: Three CIO's revealed that the CIO office coordinator is often the forerunner and taking the initiative in some regions of expertise.

Growth of the CIO office: Three CIO's admitted planning the growth of their CIO office in terms of cybersecurity either by a growing amount of rules, regulations and conditions.

CIO reporting structure
The reporting structure defines the obligation of the CIO to inform specific stakeholders within the ministry or parliament. Besides, almost all CIO's stated the secretary-general (SG) as prominent reporting structure stakeholder, two CIO's missed out of the term SG, but added the management team (ministry board) as crucial reporting structure where the SG is also seated. A complete overview of frequency and reporting structure terms is stated in figure 19.

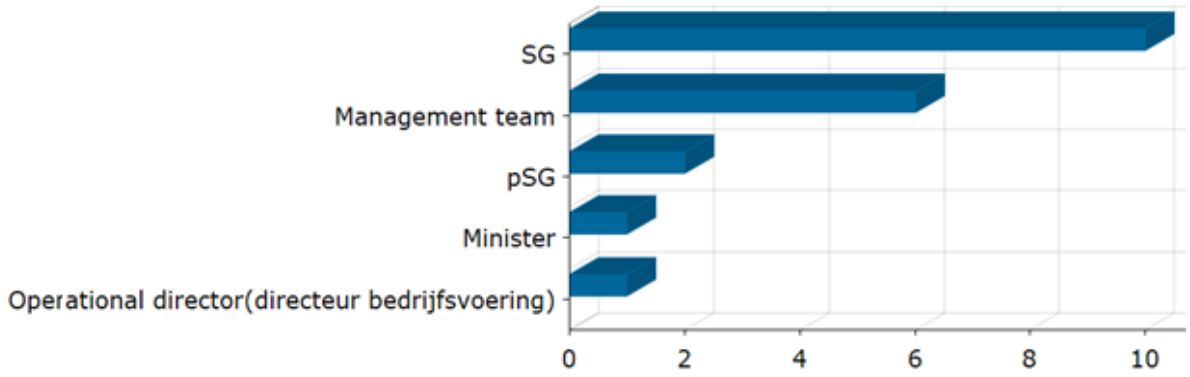


Figure 19 Results CIO reporting structure

IT policy formulation
This section concerns the answers regarding the question in which CIO's has the authority in terms of creating and implementing IT policies.

Raise support in order to formulate and introduce new policies: Five CIO's declared they have to raise support in order to formulate and introduce new policies. Three CIO's specified "raise support from the management team" in order to introduce new policies. Two other CIO's declared to raise support within the ministery itself or from the executive organization before introducing new policies.

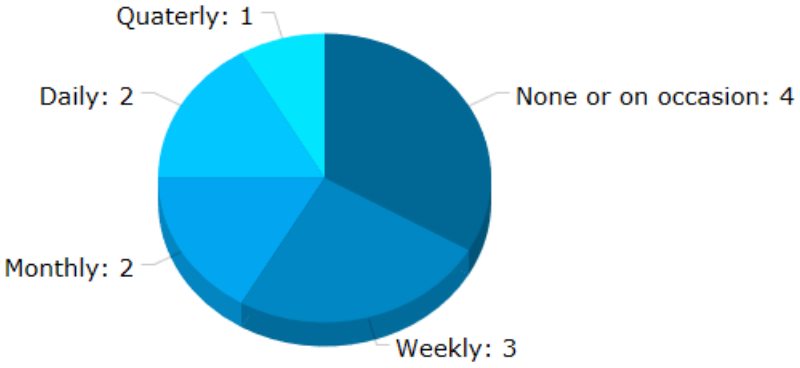
Comprehensive set of delegated policies: Four CIO's declared the accountability to manage emerging policies from the Rijksoverheid organization itself.

Mandate in formulating IT policies: Three CIO's stated to have the mandate in order to formulate IT policies. One CIO added it is the responsibility of the CIO to formulate Information technology policies. However, one CIO opposed and said it is not the responsibility of the CIO to formulate policies.

Formulating conditions and frameworks (kaders): Three CIO's declared they mainly formulate policies in order of conditions (kaders) within the department or related executive organizations by the use of IT. One CIO opposed and said this type of policy formulation is related to the IT workinplace and limiting the CIO's perspective.

In addition, one CIO declared to inform the SG in order of policy formulation and one CIO added to formulate policies and conditions in terms of information security, portfolio management and archiving.

CIO minister/minister staff interaction
The interaction between the CIO and the minister hold the frequency CIO's speak with the minister or minister staff. In addition, discussed subjects during these meetings were also declared.



CIO quote…" I have done a technical briefing in the parliament this morning, which is being discussed with the Minister"

Figure 20 Results CIO minister/minister staff interaction

None or on occasion: Four CIO's declared to have none or on occasion contact with ministers and/or minister staff. Three of these four CIO's declared they have an advising role in relation to the minister staff. In addition, one of these three CIO's added that the relationship with the minister is mainly in terms of a concern control role.

Weekly: Three CIO's said they have weekly contact with ministers or minister staff. One of these CIO's has weekly meetups with minister staff, sends letters to the parliament and is informing the minister. Another CIO in this category declared to advise the minister staff in terms of political risks, privacy (AVG) and business operations (bedrijfsvoering).

Monthly: Two CIO's told to speak minister or staff circa every month in terms of cyber and the IT service organization. One of these CIO's added to speak more frequent to the state secretary in terms of large IT projects.

Daily: Two CIO's declared to speak daily with the minister or staff. One of these CIO's spoke to the minister or staff regarding privacy (AVG), compliance, IT projects and parliamentary questions in terms of privacy.

Quarterly: The CIO which speaks the minister about every four months handles the subjects of high-risk projects and Information coordination and provision.

Relationships top- and line management
In managing relations with top- and line management, the management team of the ministery was most prominent discussed by the CIO's. Secondly, more then half of the CIO's elaborated on the CIO Council meetings which were held by the departmental CIO to bring the several executive organizations of the ministry together.

Half of the CIO's declared several ministerial management team members as an important relationship such as DG and operational directors.

Three CIO's declared elements of their CIO office as important relations.

Terms that were declared by one CIO were SG and minister staff.

A complete overview of the relationships with top- and line management of the CIO is declared in figure 21.

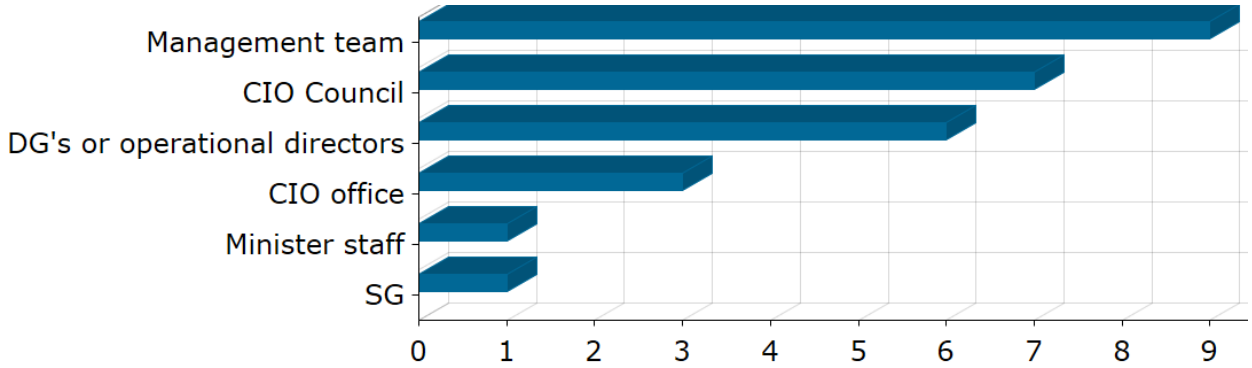


Figure 21 Results relationships top- and line management

ministry board interaction
In terms of ministry board interaction, CIO's replied short and six CIO's specified an agenda- setting role of IT in the ministry board. Two CIO's declared to have had argued their position in the ministry board.

CIO quote…"I was a total pain in the neck at the beginning. Especially in terms of budget, nowadays there is a lot of trust"

4.4 Departmental CIO IT governance

This section holds the strategic alignment of IT within the ministry and the IT decision-making processes. Furthermore, the evaluation of IT policies will be discussed.

IT objective setting & alignment within the organization

This section holds the organization of IT alignment within the organization. More specifically how the objectives of the IT organization will be set and which elements play a crucial role in the alignment of the IT objectives.

IT strategy: IT strategy is the most common term CIO's declared (9 times) by describing the objectives and alignment of IT. CIO's which did not declare IT strategy as an essential factor in the objectives of the IT organization and alignment had multiple arguments. One of these opposing CIO told that IT strategy is related to IT operations were he is in charge for the information strategy in the sector, another CIO said that they were more a visionary in terms of IT within the department, rather than a strategist. The last CIO which did not declare IT strategy said to be responsible on a strategic level, however the DG and SG had also a significant stake in the IT alignment on a strategic level.

Organizing alignment: Seven CIO's elaborated on the alignment of IT. Four CIO's declared to organize alignment with the primary process, two CIO's declared that the CIO office has a crucial stake in organizing alignment with policymakers or primary process staff and one CIO declared to have a stake in the alignment of IT vision, business and policymaking.

Business is leading: Six CIO's declared that the business (bedrijfsvoering) is leading in terms of IT objectives (business first, IT is following). Four CIO's specified the business is leading as IT objectives and alignment will be derived from the departmental/ministry vision and strategy. Also, two CIO's specified the role of the management board in terms of IT alignment and IT objective setting.

Trends: Six CIO's described the role of trends in order to set IT objectives. Two CIO's added to have contacts with private sector IT organizations in order to pick up relevant trends and one CIO said their ministry was dependent of technology and following trends was vital.

Organizational needs: Six CIO's declared organizational needs as a factor of specifying IT objects. In a more detailed manner, two CIO's described deriving these needs from portfolio management or via the CIO office.

Responsibility of executive organization: Three CIO's IT objectives within the organization is a responsibility of the IT executive organization. Were one CIO added that the pSG has a main responsibility in overseeing the alignment with executive organizations.

Vision setting: Three CIO's said to declare an IT vision in order to set IT objectives and align the IT vision. One CIO described this IT vision as an IT narrative were a diverse group of people within the organization describe their IT vision, needs and objectives and this IT narrative is followed up by the management board to discuss the IT strategy. One CIO said that describing the IT vision is the primary responsibility of CIO instead of formulating an IT strategy. Moreover, one CIO said the IT vision helps in order to discuss IT concerning new policies.

Policy alignment: Two CIO's declared that the alignment of IT objectives is also related to policies. One CIO specified this by declaring in having a role in sector policies, and one CIO described an initiating role for policies in order of IT objectives.

Leadership: Two CIO's declared a role of demonstrating leadership in terms of IT alignment. Mainly in the ministry board leadership in IT subjects were important for aligning and prioritizing IT.

Two subjects were declared once by the CIO's concerning the IT objective setting and alignement. Namely, an advising role in IT objectives & alignment of IT. Futhermore, incubator in terms of data and technology pilots to organize new technologies and align within the organization.

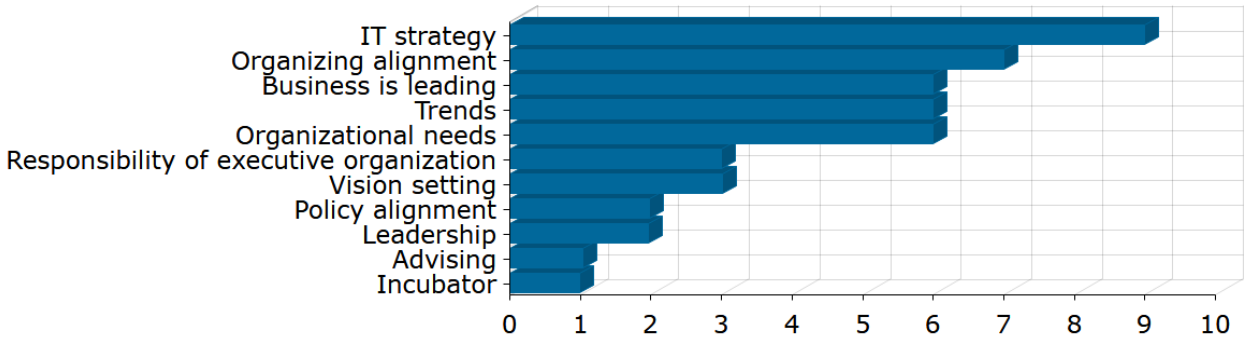


Figure 22 Results IT objective setting & alignment within the organization

CIO quote…" I will give you an example, IT was very logical for business operations, for the more traditional parts in the organization (ex. safety policy) not at all"

IT decision structure
IT decision structure declares the organizational aspects involved in decision-making processes, related to IT.

Management team (ministry board): Is declared by 10 CIO's as organizational element were IT decisions take place. Five CIO's declared the management team is mainly involved in high stake IT decisions. Were one CIO specified the involvement of the management team in IT decision with relation to political aspects and one CIO declared the involvement of the management board in IT aspects of high budget. The two CIO's which have not declared the management board didn't elaborate much on the question of IT decision structure or focused on another aspect of the question. Were one CIO declared that in their ministry a management team member (not specified SG/DG) had started a few times an IT project without informing the CIO.

Portfolio management unit: Four CIO's defined the IT decisions in the domain of portfolio management and IT projects on portfolio management unit level either CIO office.

Terms that emerged in the interviews among three CIO's were the CIO board (The internal IT organization were CIO's and CIO office meet), primary process departments that had a stake in the IT decision-making processes. Also, three CIO's declared that the IT organization was not entirely structured of decision-making units.

Elements that occurred twice during the interviews, concentrated to policymakers were decision concerning IT took place and the CIO Council (the management team of the CIO and the CIO's of related executive organizations).

Small projects were the decision responsibility is for the steering group of the project and the SG has a stake in terms of being responsible for decisions related to IT were declared by one CIO.

An overview of stakeholders involved in the IT decision structure is exposed in figure 22.

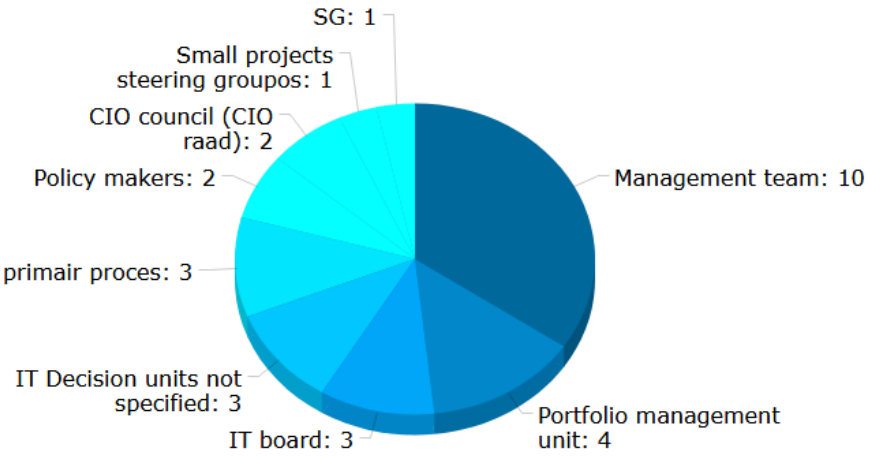


Figure 23 Results IT decision structure

IT policy evaluation
IT policy evaluation relates to the manner IT policies were evaluated.

Project evaluation: Project evaluation Was declared by 6 CIO's. Whom described the evaluation of projects each of them differently. Two CIO's described every project was evaluated. Other terms CIO's declared about project evaluation were: by a list of smiley's (explicit evaluation by KPI's is difficult), learning outcomes of the projects for future projects. Furthermore, large projects were discussed in the ministry board and one CIO said that in one of their executive organizations one IT specialist was by standard involved in projects with an IT component, which continuously observed the IT component. One CIO opposed the project evaluation by declaring he mainly performs the client role.

Policy cycle: Five CIO's said to evaluate IT policy's by standard in the policy cycle. Two CIO's elaborated further on this answer by specifying every 2 years the policy cycle evaluates IT policies. Were another CIO specified the frequency of policy evaluation by declaring IT policies will be declared yearly during the annual plan.

Inadequate: Four CIO's Declared the evaluation of IT policies was not organized or could be optimized. The four CIO's declared the evaluation of IT policies by poor evaluation, no evaluation of IT policies and IT policies would not be evaluated.

Permanent/Agile: Four CIO's declared permanent evaluation. Were one CIO declared to continuously monitor, one CIO said to be focused towards practical implementations of IT and evaluate the implementation outcomes. In addition, two CIO's declared by an agile approach were business cases will be initiated and continuous improvement cycles occur.

Six topics were emerging in the interviews among two CIO's in order of evaluating IT policies, namely: lessons learned, discuss in the management team (ministry board), information plan recalibration, gateway reviews, audits (ADR), BIT.

Two subjects emerged once during the interviews, namely: reporting towards CIO rijk and CIO approvals.

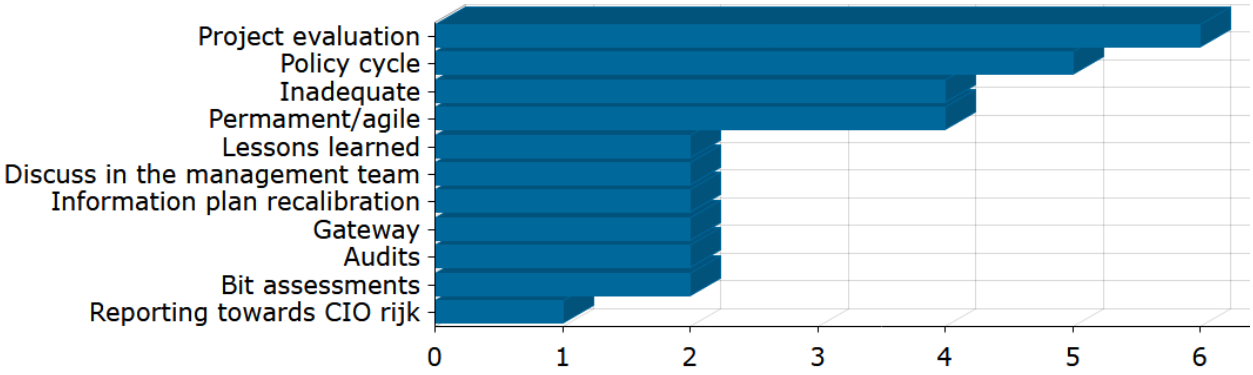


Figure 24 Results IT policy evaluation

4.5 Departmental CIO IT maturity

Concerning CIO maturity, CIO's were asked upon the priority towards data, digital transformation and the importance of IT within the ministry board.

Data and digital transformation

Data important: Eleven CIO's declared data had a significant stake in their ministry or is gaining more priority. However, one CIO declared that within their ministry there is not that much interaction between citizen or enterprises, which makes the need to collect data less evident than at their collegial ministeries. When describing the importance of data, we discovered different perspectives. Such as four CIO's described data as information or data analysis is becoming more vital in the ministry. Three CIO's declared that data was already an essential subject. Besides, one CIO which declared that they were not just applying data within the ministry, but also describing policies for the use of data in sector perspective. Another CIO said that the limiting factor by collecting new insights and data transformation is the human, to specify this sentence more contextually all data is available these days it is just essential to formulate the right questions.

Digital transformation: Eight CIO's described digital transformation, were two CIO's said that digital transformation is mainly driven within their executive organization. Two CIO's did not elaborate on this topic. Two CIO's declared that the digital transformation was mainly related to the office environment. Two CIO's said that digital transformation has a crucial role in public service delivery were one CIO added to be an IT-driven department. Three other terms which were named about digital transformation were: IT processes important, however not everything can be transformed to digital, digital transformation within the sector and the first step in launching a digital transformation project is challenging.

The importance of data within the ministry and the digital transformation were the primary subjects within this section. However, there were a few additional subjects, which were raised during the interviews several times.

Data flows: Data flows were named by seven CIO's. Were Three CIO's declared that data at the right time available for the right person and overseeing data flows is a responsibility of the CIO. One of these CIO's added they conduct data flows and a data architect is structuring this field, were another CIO declared to have yearly updates on their data flow environment. This CIO also described to organize data flows to some extent for the use by the sector. One CIO said that by privacy (AVG) guidelines, the information flows also get recognized and mapped. One CIO declared to conduct a data catalog and one CIO said to organize on data governance.

Data for policy purpose: Four CIO's said that data has a crucial role for policy purposes were two CIO's opposed. Namely, one CIO said that data is available for processes approaches, but not yet adopted in policy enhancing purpose.

Digital appearance: Four CIO's elaborated on the subject of digital appearance, were two CIO's added digital appearance was mainly related to their executive organizations. One of the reasons was that these organizations define the products, portals and closest related to the citizen processes. However, two CIO's stated the quality of public service delivery is important.

Technical improvement necessary: Four CIO's declared they needed technical enhancement concerning data/digital transformation. Two CIO's declared cloud, One CIO declared architecture and one CIO declared to become more efficient.

Data labs: In addition to data three CIO's elaborated on the existence of data labs located in their ministry. However, these data labs occurred by all three different names (data lab, data ambassadors, data board). Moreover, they had the same aim to bring people from several departments/teams together within the organization and enhance the availability and flow of data.

A few topics emerged twice during the interviews among the CIO's. Primary process enhancement is the aim of data and digital transformation and the relevance of open data.

One CIO declared the existence of a knowledge event to discuss and discover new insights in terms of technology.

By the variation of answers during this section, some example codes of the transcripts were declared in table 24.

Data and digital transformation	**Frequency**	**Example codes**
Data important	11	"important", "sector relevance" "very important", "limit factor people themselves" "data-driven attention"
Digital transformation	8	"digital transformation workplace", "public service delivery", "digital transformation sector", "IT driven department"
Data flows	7	"data flow architect", "baseline information organization", "data catalog", "data governance"
Data for policy purposes	4	"policy trajects", "policy issues use of data"
Digital appearance	4	"Digital appearance executive organizations", "ZBO digital processes"
Technical improvement necessary	4	"efficient", "cloud", "architecture"
Data labs	3	"data lab", "data ambassadors", "data board"
Primair proces	2	"primary process enhancement"
Open data	2	"open data portal", "open data"
Knowledge events	1	"event to discuss and discover new insights"

Table 10 Results priority data and digital transformation

Recognition of IT value by the ministry board
In this section, the value of IT recognized by the ministry board is described.

IT high priority: All CIO's admitted that the ministry board recognized the value of IT and it is important to them.

IT budget: Four CIO's declared IT budget is growing in their ministry. However, there were two critical notes. One CIO noted there are limited resources for discovering new opportunities and one CIO said that most ministry board members suspect that IT helps to reduce costs. However, IT is becoming more complicated, advanced and expensive when the IT function is scaled.

Grown value: Three CIO's declared a substantial growth of the IT value recognition within the ministry board. One CIO specified this by the last three years.

High interest by MT members: Three CIO's declared a high interest of the ministry board members in IT. Mainly driven by keeping up with the market development, striving to go forward and by the stimulus of the government (Rijksoverheid) itself such as NLdigibeter.

Taking responsibility of IT: Three CIO's said that responsibility setting of IT was an issue. Where one CIO said that ministry board members mainly rely on the CIO of the responsibility of IT. However, this CIO thinks that the entire ministry board must feel responsibility of IT. One CIO said that in the ministry board not always responsibility is raised. And one CIO said that the main priority of the ministry board is to support the minister.

Two topics were declared by two CIO's during the interviews. Namely the vulnerability of IT which makes it to a high priority subject for the ministry board. Another topic which is declared by two CIO's is that the ministry board sees IT as an efficiency item.

Three topics were declared once during the interviews. Namely, IT is a subject which also involves risks, IT involves changes and the ministry board has to be motivated by the CIO.

In table 25 an overview of the results including example code of the transcripts were declared.

Recognition of IT value by ministry board	**Frequency**	**Example codes**
IT high priority	12	“top priority”, “lot of attention”
IT budget	4	“from cost item to enabler”, “limited resources technology research”
Grown value	3	“grown”, “grown last 3 years”
High interest by MT members	3	“keeping up with the market”, “striving to go forward”, “priority of the government (Rijksoverheid)”
Taking responsibility of IT	3	“feeling responsible”, “priority to support the minister”
Vulnerabilities	2	“vulnerability”, “continuity of IT”
Efficiency	2	“Working faster and better”
Risks	1	“risks”
Changes	1	“changes”
Motivating ministry board	1	“motivating management team”

Table 11 Results recognition of IT value by the ministry board

4.6 Departmental CIO responsibilities

In terms of departmental CIO responsibilities, two categories will be discussed. According to the interview guide, we discuss the responsibilities the CIO has concerning data and digital transformation and responsibilities the CIO has to add in the context of the departmental CIO.

Data: Nine CIO's declared to have a responsible task in terms of data. Five CIO's declared they have an agenda-setting role within the ministry board of this subject. One CIO said to have an experimenting responsibility in terms of data. One CIO said that the SG also has a (final) responsibility in this domain. One CIO said to gain more responsibilities, the budget also has to increase. Moreover, one CIO said to have a more directive role of data into policies instead of an operational focus.

Digitalization: is declared by six CIO's, three CIO's described the responsibility in terms of digitalization as digital office environment, change programs and finally digitalization in the sector.

Data analytics: Is declared by four CIO's.

Furthermore, there are several subjects which were named by two CIO's in about the responsibilities of the CIO in the domain of analytics and digital transformation namely privacy and formulating policies.

Five topics were declared by one CIO, namely: information security, data flow visualization, ethical, initiating and archiving.

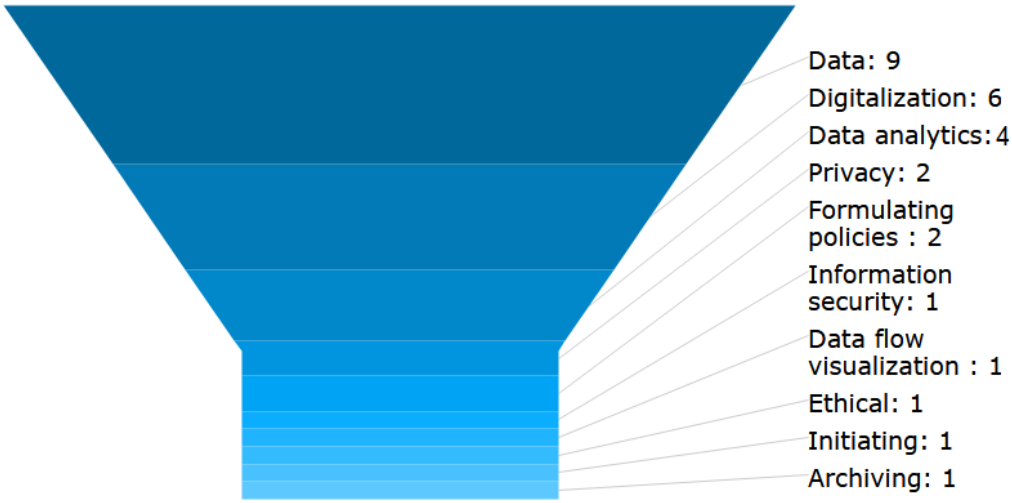


Figure 25 Results CIO responsibilities in the domain of data and digital transformation

Additional responsibilities related to the departmental CIO

As the previous figure focusses on the CIO responsibilities in the domain of data, analytics and digital transformation. This section holds the results CIO's added as responsibilities in terms of their function/role as CIO.

Compliance was declared by four CIO's. Were one CIO's specified this term as account holdership in terms of being in charge for the executives organizations of the ministry.

Information was declared by three CIO's. Were one CIO describes this in terms of information strategy, another CIO called this information provision and finally, one CIO said to feel responsible from the transformation of primary process to become more involved by the use of information.

A few topics were declared by two CIO's.For example, two CIO's felt responsible for the control of supervision the IT function and IT operations. However, two CIO's opposed the control responsibility

by not identifying with this term. Two CIO's also stated project management, social benefits, trends & developments and stimulating IT awareness.

Architecture and financial responsibility were named once among the CIO's.

An overview of declared Additional CIO responsibilities is presented in figure 26.

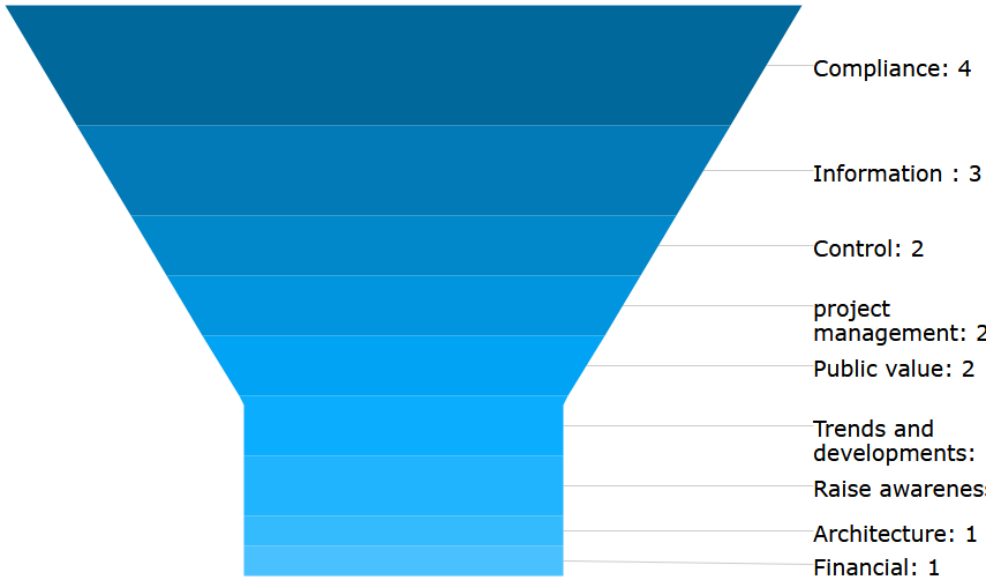


Figure 26 Additional responsibilities departmental CIO

4.7 Departmental CIO additional notes

During the interviews, CIO's were asked to raise their viewpoint upon 20 different questions. Finally, some CIO's has added some additional feedback notes.

CIO quote.. "There is a remarkable difference in responsibility if the CIO combines this role besides a pSG function. As the role of CIO was introduced according to the three lines model based on accountancy principles. The first line is the main responsible person, namely the director. This director is supported by an I-controller which is me, and this is the second line. Originally, this role is conducted on the basis of failed ICT projects, so we need to introduce a CIO. These days we observe a change towards direction and policy-setting authority. That is a completely different role as their basis founding. "

CIO quote… "Personally, my opinion is that the ministerial organization of the CIO within this ministry is well organized. We are in the middle of the organization and it is naturally we have to deal with all kinds of organizational models and responsibilities. However, it also depends on the people how successful a CIO is."

CIO quote… "At first, the CIO had to be positioned deeply within the organization, later on, it was an overseer. I think there is no single stated interpretation of the CIO. At a small ministry, the role of overseeing and raising advice is sufficient. Ministeries which have not their own IT service provider are less bulky than others. It depends on the concentration and structure of the ministery how IT-driven they are."

CIO quote.."I am curious to get an overview of how everyone fulfills the CIO role. What I am currently observing is the enormous differences among the departmental CIO's. Variating from a pSG CIO type and an implementation CIO type."

Chapter 5. Discussion

In this chapter, the results of this study will be interpretated and related to the existing literature findings of the theoretical framework. In addition, identified gaps and future research recommedations will be addresses in relation to the current method of this study.

5.1 Responsibilities and roles of the CIO

In this section, we focus towards the responsibilities of the CIO in terms of data and digital transformation as the literature shows a significant increase in value of information, the growth of digital capabilities and a focus towards security and risk management in the CIO environment. In addition, the main roles the CIO's described during the interviews will be discussed. Were current CIO studies in the literature review elaborate on the CIO role evolvement and it's leadership capability.

5.1.1 CIO responsibilities

During the result section, most CIO's stated to feel responsible for data and digitalization. In a lesser extent we found the responsibility of data analytics. As we oberve the result section, most of the interviewd CIO's feel responsible for data in agenda setting and a stimulative manner. As one CIO described it as: "I feel responsible to stimulate the use of data", there was another CIO which described this responsibility as: "I feel absolutely responsible for the use of data, by the use of data we can fulfill our public role to the fullest extent and make the world more predictable". In terms of digitalization, several CIO's declared that this was the aim of the CIO function. As CIO's declared to feel responsible in these domains, the finesse a few CIO's decribed during the interviews focused towards data analytics, privacy and data governance (formulating policies).

The study of Polansky, Inuganti and Wiggins [41] stated that analytical and forecasting capabilities of information became during the 00's more important. Also the study of NASCIO specifically conercend in the domain of the public sector declared a vital role for the CIO in the domain of the forecasting and analytical capabilities of information within the enterprise. [47] In the literature section concerning IT value Chircu stated IT value in the public sector is declared in economic value (cost reduction & increased efficiency) and political value (information accuracy and social benefits).[84]

Based upon the results in relation to the existing literature, we mainly see the CIO's in this study mainly describe data in terms of feeling responsible and stimulating. Thus, several sources describe the CIO have to establish data infrastructures for data management and raise input for upcoming trends such as digital government. In addition half of the CIO's also declared in this section to feel responsible for digital transformation which could be seen as stimulating a climate were digital capabilities were captured and implemented.

Additional CIO responsibilities

Additional responsibilities a few CIO's actively mentioned were compliance, information, control and project management. Also the current CIO profile of 2016 [6] holds several responsibilities of the CIO such as update IT strategy, project portfolio management, organize governance and collaboration. In this study we've mainly focussed on the responsibilities in the domains of data and digital transformation. While the current CIO profile of 2016 [6] has a lot of overlap with older CIO responsibility models such as the nine square model of Maes. [51]

A founding, which wasn't declared in the literature section for public sector CIO's, but named by a small amount of the CIO's in this study was the responsibility of strengthen the public value.

5.1.2 CIO roles

The terms of advisor, controller, audit role and overseer were frequently emerging among the CIO's in this study. One CIO explicit stated: "The CIO role is absolutely an advising role in relation to the top.". However, in a lesser extent leadership (guiding/coordinative), motivator, formulating policies and conditions emerged among the CIO's in the result section.

In the literature review Ross stated the credibility and the importancy of information technology within the enterprise define the success and ability of the CIO [48]. Specifically in Public Sector domain NASCIO raised the term of CIO leadership were the CIO has to build relationships and inform to become strategic relevant. [54] Also two CIO's in this study stated the crucial role of decisive power among CIO's, however these 2 CIO's which declared the decisive role, were also the CIO's which fulfilled the CIO position for the longest period.

When observing the leadership role of the CIO from perspective of the research of Smith and Mclean [50] it seems the CIO's mainly perform a control and overseeing role in a stable environment which enforces the CIO mainly to act in an stable and predictable environment as technologist. Were decisive power could raise the CIO in a role which is more relevant to the term of strategist.

In addition, as the research of NASCIO [54] stated an important element in the leadership potential of the CIO and the study of Ross [48] declared the credibility of the CIO were important to become strategic important, the average CIO period among the CIO's in this study is 3 years. In addition, a few CIO's perform this position less then one year. Therefore, it seems hard to build credibility and leadership potential in such a short period. A graphical representation of this analysis is presented in figure 27.

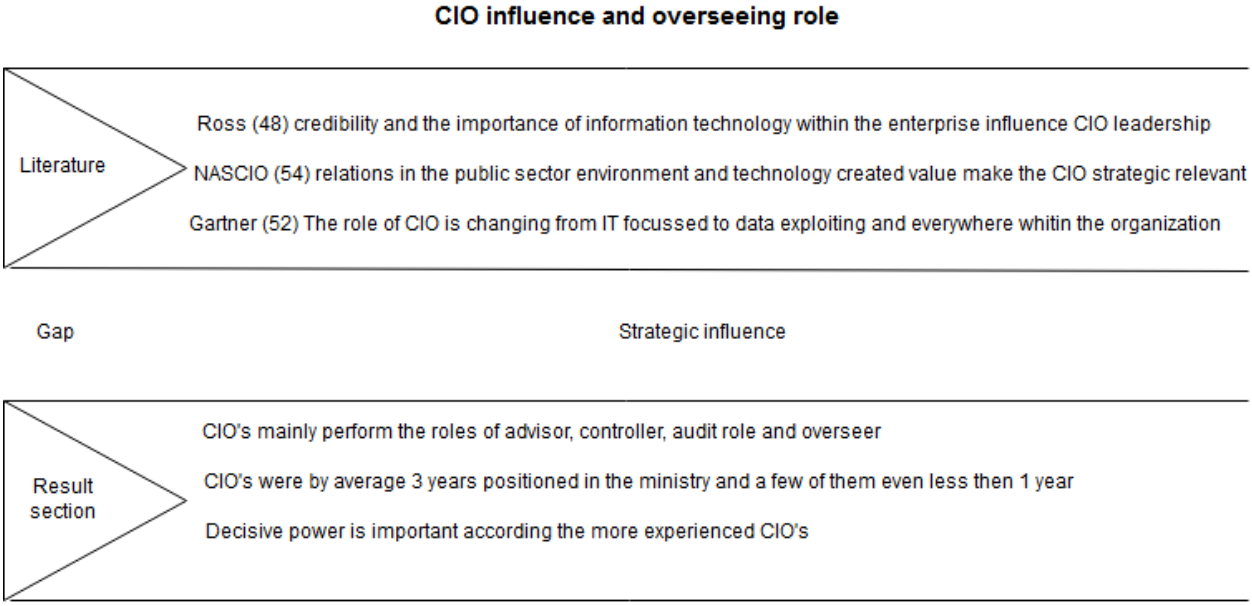


Figure 27 CIO leadership role discussion

As mentioned in figure 27, several contradictions occur in the credibility and overseeing role of the CIO. Research of Ross [48] states the CIO has to build credibility and the research of NASIO [54] states the importancy of relations. However, most CIO's mainly perform the role 3 years and describe the role of controller. However, the more experienced CIO"s describe decise power is important. In this case we miss the strategic influence of the CIO, which could be investigated in future research.

Also, in relation to the responsibilities most CIO's feel responsible for data and digital transformation, we've recognized the role of information manager actively mentioned among a small amount of CIO's, which implies the CIO's recognized this responsibility, but not primarily state this as a role to act upon.

Besides the leadership potential of the CIO, several sources defined more specific roles according to the CIO such as the research of Lawry & Waddell [46], Maes [51] and Gartner [52]. Where several mentioned roles match according to the research of Maes [51] and Lawry & Waddell [46] in the domains of manage staff (leadership and motivator), strategic planning (directive), business transformation (primair

process partner), governance, policies and procedures (advisor or partner in policy creation). However, in the domains of Eduction of IT in Business context and technical competivess & awareness we had a small amount of CIO's which declared these domains in the role section such as: "Last year I've provided Information technology training for employees for policy makers and middle management". In terms of technical competivess, a CIO declared to conform strategic supplier management in order to enhance the IT functionality in co creation to the market. However, the last two subjects were just described by a small amount of CIO's.

By investigating more specified CIO roles, it seems CIO's mainly concerned towards the coordination and control, rather then training/empower employees and transform in terms of technical relevance.

CIO role evolvement in new technology perspective
The last decades several technologies and abilities by the use of IT influenced the role of CIO accorinding to Gartner. [52]

In the result section most CIO's agreed up on the fact the role is envolving and covering a larger extent of subjects. One CIO described this as*:* "The workload of the CIO enlarges, however technology isn't the single specific factor"*.* Where the CIO elaborated on the fact rules, regulations and conditions in the CIO environment also enlarges. Remedies CIO's has in order to deal with the evolvement and the growth of the role were prioritizing and initiating new methods and technologies. Were the Gartner research states a more collaborative agenda setting with enterprise decision makers and people across the organization in a creative, data-exploiting platform focussed environment.

Therefore, it seems the CIO's prioritize and initiate new methods and technologies. However, new technologies makes it also hard to implement by rules and regulations.

5.2 CIO position

Nine CIO's performed the CIO position as a role besides their current function, (five CIO's fulfill the role of CIO besides the function of pSG). However, three CIO's perfomed this position as a fullfilling function. In addition, all of the CIO's has an established CIO office. As we observe the common subjects, which were organized in the CIO office, CIO's mainly elaborate in the domains of information security, CIO office in relation with the primary process and a planned growth of the CIO office in terms of information security. As one CIO described these priorities as: "There is not a strict defined CIO office, the CIO office is interwoven with the business operations within this ministery. The team which is strictly focussed towards CIO office tasks is mainly focussed towards the project portfolio management and information and cyber security. As we've seen the last subject is becoming more important and recentlty we've hired extra people within this domain."

Therefore, it seems the CIO deligates some tasks towards CIO office members in specific domains such as information and cyber security.

Reporting structure CIO & minister contact

Results concluded in our study, that almost all the CIO's report to the secretairy general (SG). However, reporting towards cabinet positioned staff was declared to a none/very small scale. As we observe the frequency CIO's has contact with ministers or cabinet level staff, most CIO's has contact on a frequent scale with the minister or their staff members, however a few CIO's declared there is no contact on cabinet level or minister staff members.

In perspective of a study of NASCIO 30% of the CIO's report to the governor, 20% report to cabinet level positions and 50% of the CIO's primarily report to non-cabinet level positions. [60]

In terms of contact with minister staff it seems mostly in the domain of large IT projects and information security. Which implies the political relevance in order to strengthen the relationship with minister staff.

CIO policy mandate and ministry board interaction

When formulating policies in terms of the IT domain, most CIO's declared they have the mandate to formulate policies, however to gain support in order to get the new policies approved is important according to most CIO's. In order to raise support of these newly created policies, they raise support from the ministry board were most CIO's declared to have an agenda setting role within the ministry board. A small amount of CIO's declared to have full mandate in order of IT policies and had to argument their position within the ministry board. As we oberserve indicators which influence the status and the position of the CIO, who is in charge for the IT direction, the alignment of IT, the IT skills among the different level, the justification of IT investments and whom benefits of the use of IT plays a crucial stake in the status and position of the CIO.[59] In following of this study we've seen all CIO's were positioned on ministry board level and has an agenda setting role in admitting the importance of information management within the ministry board.

Thus, we have not asked the CIO's to which extent they stimulate new initiates or implied ways to take the lead in the domain of IT. Were it seems in this extent, the CIO is mainly following the current ministry strategy instead of enabling IT technology opportunities.

Top- and line management interaction

In terms of top- and line management interaction, most CIO's declared to have a position within the ministry board. Futhermore, most CIO's declared to have frequent meetings with CIO's of the underlying (executive) organizations of their department within CIO council meetings. Other frequent relations CIO's declared to maintain concentrate towards the DG and other directors. In the literature we haven't found specific public sector CIO relationship diagrams.

5.3 IT Governance

When investigating the result section in terms of IT goal establishment and alignment, most CIO's declared to refine objectives in the IT strategy. However, more specific terms which were raised in this section concentrated towards organizational alignment with the primary process and policymakers were a few CIO's declared that this was the responsibility of the CIO office to be interwoven within the primairy process. Other frequent terms which were emerging said the business is mostly leading in setting the strategy and IT objectives were derived from trends and organizational needs. However as this terms were broad in the public sector we observe a complex field, were accountability and the relationships between public service organizations and the parliament make alignment more complex. [66] In terms of being leading in IT. According to NASCIO IT objectives emerge in the domains of political forces (support & policy changes), market forces (technical & service optimization), customer forces (maturity & service offering) and internal forces (organizational design). [67]

CIO's often described during the interviews to retrieve IT objectives mainly from the departmental strategy, trends and needs which emerged in the organization. We missed out on customer forces & market forces (citizen government interaction & technical relevance) on a large scale, also the domain of balancing the enterprise and agency interest was not fully describes in order to stimulate organizational digital learning capability. Instead, the alignment is more concerned towards a departmental strategy following approach.

Therefore, it seems most CIO's concerned with the IT objectives in following the departmental strategy combined with emerging trends and organizational needs. It seems IT objectives were less prominent investigated in market relevance, citizen relevance and political relevance.

Decision structure within the ministry in the domain of information technology

Almost all CIO's declared the ministry board as a crucial element in the decision making process among the information technology domain within the ministry. Mainly the ministry board is involved in high risk/ high costs IT projects in order to make IT decision. Another founding which emerged is the portfolio management unit which is mostly organized by the CIO office has an important stake in the departmental IT decisions. We've also found that among some CIO's IT decisions units were not specified or smaller IT projects were given approval by the CIO and during the process later decisions took place by the steering groups of these projects. In the literature review, several Governance mechanisms were declared by Weill such as executive committee and IT councils [66] which were also in line with the findings among the CIO's. Other governance mechanisms which weren't declared by the CIO's but emerged in the study of Weill were Architecture committee. However, depending on the performance indicator and desirable behavior governance mechanisms can differ. In the interviews emerged that the CIO's had mainly a high overview of IT decision structures within their department. In the literature review emerged in the public sector organizations relationships between public service, government and parliament including ongoing changes makes it more difficult to establish efficient decision-making processes in relation to private sector counterparts.[64]

It seems CIO's mainly were involved in high level, high risk project decision structures. Were portfolio management unit's mostly established within the CIO office look after more specific IT (project) decisions. We haven't investigated in this study entire IT governance decisions flows and IT value adding elements within the enterprise.

IT policy evaluation

During the IT policy evaluation section, most CIO's declared evaluation in the IT domain took place by project evaluation and policy cycles. The third result which emerged among several CIO's was admitting IT policy evaluation was inadequate or not frequent. However, a few CIO's elaborated on the existence of audits, gateway reviews and BIT assessments which in fact assess all IT projects within the Rijksoverheid with an IT component >€5 million. In the literature Weill stated Effictive IT governance is beneficial in terms to measure and derive desirable behavior from the IT function in order to govern, structure and derive value and desirable behavior.[65] One CIO also added by the question if there is any existence of KPI's in terms of IT governance that the CIO has to balance control and the human aspect of their employees and it's not favored to use KPI's in that manner.

IT policy evaluation is according the CIO's mainly done by the evaluation of IT projects and policy cycles. However, to derive desirable behavior, harmonize IT governance mechanisms and create value in the IT domain, metrics were favored according to according the literature of Weill.

5.4 CIO maturity

As we've discussed several CIO maturity models related to the scope of this study, in this section these maturity models were revealed in relevance to the found results of the departmental responsibilities, roles, position and IT governance.

Within this section, we have elaborated on the possible future to add dimensions for current CIO maturity models in relevance to the departmental CIO.

In the model of Gartner Digital Government[74] the perspective of digital transformation and value creation in discussed, while the model of The Organization's maturity[75] elaborates on the agility and empowerment of the CIO among the employees in the organization, where the CIO is becoming a facilitator. The third and final maturity model of the literature review states the growth of the strategic IT function and alignment. [76]

During the interviews we've asked the CIO's upon to add additional information in the domain of Data and digital transformation, were most CIO"s admitted data is important in the position of CIO and digital transformation and service delivery is also a vital element of the CIO.

Several CIO's revealed by work in process to enhance the data flows and data labs within their ministry. Data flows were defined in several manners such as a data flow architect, data catalogs and data governance. Data labs were described by a few CIO's as data ambassadors or a data board.

In addition to the data flows, we've discovered during the previous discussion paragraph that IT decision units in the organization and the revealed value from IT decisions or the desired behavior is also not always obvious and reporting structure is small. In perspective of maturity, this can be named as "IT decision flow and organogram". In a more contextual manner from policy to end product and steering and added or missed value within the traject.

Another element which was revealed during the study was the element of several CIO councils and CIO roles. However, this founding relates close to the agility CIO maturity model and CIO leadership.

Moreover, several CIO's and also in the literature section described the need as CIO and public organization to stimulate public value. However, the CIO takes a small responsibility in market (sector) and customer (citizen) value. However, there was one CIO who did.

Finaly, the rise of awareness, training and empowerment from the CIO towards employees existed in a small number of scenarios. However, also this founding exits already in some CIO maturity models. Such as the model of Gartner.

As there exist several CIO's maturity models with each a different perspective, we see during this study that the overview of organizational IT decision structures including evaluation and the creation of public value by IT can be added elements to existing CIO maturity models specifically for the departmental CIO.

5.5 Limitations

In this study, we have mainly focussed towards the responsibilities, roles, position, IT governance and CIO maturity of the CIO within Dutch central Government. Which limits the representation of the Public Sector environment CIO in a broader context, where this study just focussed in context of the Public Sector in the Netherlands. In addition, CIO's exist within the Dutch central government at several layers within the organization (ministry, implementation organizations) were we mainly focussed towards the ministry CIO's.

In addition, the fact that CIO's within each ministry have a different focus area of subjects and primary roles they fullfill (IT controller, closely related to business operations or Overseer) makes the several subjects such as responsibilities and roles diverse for interpretation. However, this study focussed to formulate a common profile rather then distinglius several type of CIO's and segment these profiles.

Moreover, IT value proposition within the Theoretical framework related to the CIO as contextual information, we haven't really elaborated on this subject. Were economical value and political value has a crucial stake in several sources according to the CIO and it's estimated added value within the public sector environment.

During this study responsibilities covered a broad spectrum, were we've mainly asked the CIO's upon responsibilities in the field of data and digital transformation which was missing in the current CIO profile of 2016 [6] and forms an important element in several recent CIO responsibility models.

Another research area that had it limitations was IT governance. Were this study concentrated towards the organization by the CIO in terms of IT decisions within the organization, IT objectives and elaluation. IT governance covers a much richer domain within the ministry and the CIO is mainly concerned in the large projects and visionairy setting of IT either strategic decisions within this subject.

Finally, CIO maturity covers addable attributes to new (Public Sector) CIO maturity models. However, maturity models form a general interpretatable representation, which can be enrichend and more specified to formulate a maturity model specified for the current CIO profile at the Dutch central government.

Chapter 6. Conclusion

The position of the CIO within the Dutch Central Government was created (in 2008) by the aim to control and supervise IT projects, were costs and deadlines were often exceeded. The CIO position was initially invested at ministry board governor equivalent or established as CIO function within the ministry in order to stabilize and control the IT function especially in terms of IT projects. Because of the diverse perspectives, positioning and organization among departmental CIO's the following research question is established:

"Based on the departmental CIO responsibilities, roles, position and IT governance, which maturity attributes can be added to existing CIO maturity models in Dutch central government (Rijksoverheid) CIO perspective?"

Within this study, all 12 ministries were involved, and 11 CIO's including 1 deputy CIO was asked upon their view. In this chapter, the main results that occurred during the interviews were explained and essential notes of the discussion were cited in relevance to the research questions of this study. Every sub question of this study will be handled in the following section and finally the main question will be concluded.

"What are the responsibilities and roles of a departmental CIO at the Dutch national government?"

Several CIO's raised the argument to organize compliance within the IT domain of the ministry concerned their responsibility. In addition, CIO's feel responsible for information, project portfolio management and feel responsible in the domains of data, digitalization, and a lesser extent data analytics.

In terms of roles, advising top management in terms of IT, controller, coordinator and motivator frequently emerged during the CIO roles result section. These roles are highly related to a stable and efficient environment/CIO leadership role. However, more experienced CIO's declared the importance of decisive power and formulating policies. Moreover, roles which identity with technical relevance were discussed in a lesser extent. In response how CIO's deal with the enlargement of the role and the growing abilities of technology, CIO's respond to recognize these trends, but also have to deal with deligated rules and political changes which raise the priority.

During the literature review we've found that the responsibilities and roles of the CIO interrelate with the recognition of the IT component within the organization, the status of the CIO and the leadership ability of the CIO. By the efficient environment, the role as overseer and CIO's which fulfill the role by average of 3 years we've mainly observe a CIO which is in charge for compliance and overseeing the IT landscape. In addition, we recognize that CIO's felt responsible in the domains of data and digitalization. In terms of roles, related roles of data and digitalization sporadic emerge.

"Which factors contribute to the position of departmental CIO at the Dutch national government?"

Most of the departmental CIO's fulfill this position as a role, which means they combine the position of CIO with another (ministry) function. Mostly occurring is the combined function of CIO/pSG. In addition, all of the CIO's has a CIO office, which supports the CIO in specific domains such as information- and cyber security.

All of the CIO's were positioned in the ministry board, were most of the CIO's report to the SG (secretairy general). However, the frequency CIO's has contact with ministers and staff varies from daily to almost none. The contact with ministers and/or minister staff is mostly declared in the domains of large IT projects, information security and political relevance.

In order to formulate policies, most CIO's declared to have the mandate to formulate new policies. However, to get new policies approved it is important to raise support among the ministry board. Within the ministry board, most CIO's declared to have an agenda setting role. In addition, other relationships most CIO's maintain were meetings with CIO's from related ministerial implementation organizations and DG's.

"How is IT governed and organized by a departmental CIO within the Dutch national government?"

We've observed that most CIO's organize the IT strategy/vision by the ministry strategy were the ministry strategy is leading. Also IT objectives were based on organizational needs and primairy process elements. However, we've observed in relevance to the public sector CIO literature a broader domain of the IT objective setting among the CIO, were the public sector CIO organizes the IT in the domains of political forces (support & policy changes), market forces (technical & service optimalization), customer forces (maturity & service offering) and internal forces (organizational design).

The organization of IT vision mainly hold place in perspective and alignment of the ministerial strategy. In term of IT governance and decision structure, we've also observed a vital role of the ministry board in terms of large / high risk IT projects. In addition, most IT projects were organized by the portfolio management unit which is situated in the CIO office. And smaller projects were given approval by the CIO and organized by the project team itself. Concering the decision structure in terms of Governance, the CIO is mainly focussed on IT projects and high-level decision-making.

In terms of IT policy evaluation, the CIO's were mainly concerned towards IT projects and policy cycles. Also a few CIO's declared that the IT policy evaluation was inadequate and there is a potential for improvement. When concluding the IT governance and organization we've observed mainly the perspective of high risk/high potential IT projects and ministry board equalivent. However, this study is focussed towards the CIO in relation to IT governance we haven't found in a high frequency IT decision flows, decision processes and the evaluation IT value adding elements within the enterprise.

"Based on the departmental CIO responsibilities, roles, position and IT governance, which maturity attributes can be added to existing CIO maturity models in Dutch central government (Rijksoverheid) CIO perspective?"

Although there exist a variety of CIO maturity models, attributes which can be relevant in order of the departmental CIO include the maturity level of IT decision structures including evaluation methods, enlargen the public value of IT (citizen minded, technical relevance, mutual responsibility of IT at several levels). As leadership ability and alignment also were relevant characteristics, several maturity levels include allready these aspects.

Finaly, the departmental CIO holds mainly compliance responsibility, were the CIO also feels responsible for information and digital transformation. However, in the roles section of the CIO we mainly observe controling and overseeing roles in a stable and efficient environment. The position of the CIO is organized on ministry board level, however we were missing a leading role and strategic influence in the IT domain in terms of technical relevance and citizen minded. The CIO's mainly follow the ministry strategy and raise support in the ministry board. However, we also found more experienced CIO's and the literature wich stated the CIO has to build credibility, political and economical value and decisive power including the right relationships in order to become strategic relevant.

6.1 Future research

In this study, we have found several contradictions, which could be investigated in order to raise clarity about the CIO role, and it's effectiveness within the Rijksoverheid environment.

As we have observed several CIO's stated that the CIO role enlarges in terms of tasks and opportunities by the rapid envolvement of technology. Simultaneously rules and conditions in the environment were also enlarging concerning new technologies, which could be observed as the maturity potential and the decelerating factor of emerging innovation by an extensive rule set. In this perspective it could be relevant to investigate how an extensive rule set or new rules affect the current CIO/IT decision enivornment.

Another founding which needs more clarification is the literature states a CIO has the raise competence credibility in order to become strategic relevant. However, the RIjksoverheid states the CIO is mainly a communicator. Were the average CIO period is just 3 years. In this section, we mainly observe the literature section, which encourages the strategic relevance of the CIO. However, to gain strategic relevance in the current ministry environment and the reasons why the CIO period is by average just 3 years could be interesting studies. Including the paradox communicator versus competence by the CIO.

Another uncertainty which emerged was the importance of IT value creation, establish an IT vision and governance structure. Were some CIO's stated the evaluation among IT policies were inadequate or can be improved. Also, in the current environment, the CIO is raising support instead of taking the lead in the field of launching new initiatives. In this perspective, we've mainly observe best practices in the literature section which holds several governance mechanisms in order to accomplish the IT vision and create IT value. However, in the current environment it seems still inadequate to gain maximum value out of the IT value. In this future research, goverance structures for the ministry environment could be investigated in order to maximize the IT value. Were several studies also shown public sector organiztions were more complex by a variety of stakeholders and responsibilities in order to define IT governance structures.

Finally, several studies describe the more considerable extent of IT within enterprises were IT is everywhere, and IT has to become a responsibility which is held accountability by multiple board decision makers instead of just the CIO. Were IT support mechanisms could be investigated.

Appendix 1 Theoretical framework maturity stages (Peppard,Edwards,Lambert)

Table 1: Comparison of the Five CIO Roles

	Utility IT Director	Evangelist CIO	Innovator CIO	Facilitator CIO	Agility IT Director/CIO
Scope of The Role	• IT supply orientation. • Reports to CFO. • Strong technical bias.	• Changing mindsets about information. • Identifying sources of competitive advantage.	• Delivering opportunities for securing advantage. • Raising profile of the IT unit as a business partner.	• Empowering and enabling the business with information capabilities. • Levering IT assets.	• Developing agile infrastructure. • Coordinating organizational information and technology requirements.
Issues Critical to Success	• Maintaining service levels. • Ensuring the integrity of IT infrastructure.	• Securing "face time" with CxOs. • Maintaining existing IT performance levels. • Attendance of CxOs at the IT steering committee.	• Delivering meaningful business innovations. • Securing business commitment for significant business change. • Appointing demand managers. • Being part of the strategy process.	• Encouraging information ownership by the business. • Preparedness of the business to adopt new skills. • Training and supporting capabilities to enable business innovation with IT.	• Maintaining service levels. • Identifying emerging technologies. • Ensuring integrity and agility of technical architecture. • Reading the technology marketplace. • Guaranteeing security and privacy.
Performance Metrics	• Cost control. • Service availability. • Efficiency. • On-time project delivery.	• Maintaining service levels. • Number of "converts." • Securing availability of a small "piloting" budget.	• Value of innovations developed. • Requests for additional service.	• Outstanding ROI from information. • Achieving competitive advantage from information exploitation.	• Service availability. • Customer/user satisfaction. • Technology responsiveness.
Challenges	• Securing budget. • Gaining management attention. • Stopping users' DIY IT.	• Understanding the business and the industry sector in detail. • Securing "airtime" with senior executives. • Establishing credibility with business colleagues.	• Ensuring continued investment in strategic opportunities. • Limiting key operational and support applications. • Gaining active governance of IT at board level.	• Managing migration of IT innovation into the business. • Letting go.	• Staying at the cutting edge of technology. • Managing intelligent and demanding users. • Setting technical standards and policies. • Speed of response.
Relationship with CxOs	• Not necessary, as most interactions are with operational staff.	• Sporadic. • Fighting for time with CxOs.	• Regular formal and informal meetings. • Challenges valued by CxOs.	• Trusted partner.	• Advisor on policies and risks. • Advisor on technical capabilities.

104

[104] Peppard, J., Edwards, C., & Lambert, R. (2011). Clarifying the Ambiguous role of the CIO.

Appendix 2 Theoretical framework maturity stages CIO priorities (Gartner)

Related Priorities

Table 1. Related Priorities

Priority	Focus
Risk Management Program	Risk management programs mitigate the impact of uncertainty on business performance. Gartner recommends an integrated risk management (IRM) approach to build and sustain successful risk management.
Application Strategy and Governance	The application strategy and governance initiative encompasses key disciplines that must be embraced as organizations evolve.
Modernizing Application Architecture and Infrastructure	Application architecture and infrastructure provide the foundation for application systems. They impact your applications' agility, usability, scalability and availability.
CIO Mastery of Leadership, Culture and People Dynamics	The CIO mastery of leadership, culture and people dynamics initiative unlocks the professional, organizational and performance practices to meet changing business, societal and technology demands.
CIO Leadership in Governance, Strategic Execution and Operational Performance	CIO leadership in governance, strategic execution and operational performance comprises how to establish outcome-based situational governance to drive execution and deliver operational performance.
Infrastructure Agility	The infrastructure agility initiative focuses on Mode 2 of bimodal — which tends to be exploratory, but potentially transformative — as the foundational IT platform for digital businesses.
CIO Leadership in Innovation and Strategic Business Change	In the digital era, CIOs have two jobs: business leader and IT leader. This initiative delivers to the first job, addressing how CIOs can contribute to the development of an enterprisewide strategy.

Source: Gartner

[105]

[105] Nielsen, T. (2017). Renewing the IT Organizational Model Primer for 2017. Gartner.

Appendix 3 Interview Guide

Algemene introductie:
Fijn dat wij u kunnen spreken betreft de invulling van de departementale CIO rol binnen dit ministerie. Graag wil ik u vragen of dit interview mag worden opgenomen, waarbij de audiobestanden worden vernietigd zodra deze in een transcript zijn verwerkt. Het transcript met bijbehorende uitkomsten zal anoniem worden vermeld. Verder zal dit interview bestaan uit 5 hoofdthema's waarbij inleiding wordt gegeven en enkele vragen worden gesteld.

Vraag Achtergrond
- Hoe lang bent u werkzaam als CIO van het betreffende ministerie?
- Wat is uw werk gerelateerde achtergrond?

Rollen: De rol van CIO is controlerend en adviserend ingestoken, waarbij we constateren dat deze steeds meer naar I in het hart van beleid toegroeit. Daarmee worden CIO-rol ontwikkelingen gevolgd als co-creator bedrijfsstrategie (creëren en meebeslissen in bedrijfsstrategie), leiderschap (IT bedrijfswaarde en positie versterken) en informatie strateeg (informatie binnen processen strategisch inzetten).

Vraag Rollen
- Hoe ziet u de rol die de CIO vervult?
- Wat ziet u als andere rollen die de CIO vervult?
- Hoe gaat de CIO om met een toename van rollen door bijv. technologische trends?

Positionering: Onder positionering verstaan we de relaties die de CIO onderhoudt, de verantwoordingsstructuur en de autoriteit van de CIO.

Vraag Positionering
- Is de CIO een functie of rol binnen dit ministerie?
- Hoeveel medewerkers heeft de CIO office en hoe verloopt de organisatie?
- Aan wie rapporteert de CIO?
- In hoeverre kan de CIO IT-beleid doorvoeren binnen dit ministerie?
- Is er enig contact tussen de CIO en de minister/staatsecretaris en waar gaat dit contact over?
- Hoe worden door de CIO relaties met top en line management onderhouden?
- Hoe verloopt de interactie tussen de CIO en de bestuursraad van het betreffende ministerie?

IT governance: De structuur, verantwoordelijkheden en de beslissingen om IT strategie te organiseren en waarde uit de IT keten te generen.

Vraag IT Governance
- Hoe worden doelstellingen voor de IT organisatie vastgesteld en uitgelijnd met bedrijfsdoelen?
- Hoe is de besluitvorming rondom I georganiseerd binnen dit ministerie?
- Hoe wordt IT beleid geëvalueerd?

IT volwassenheid: Onder volwassenheid verstaan we de evolutie en waarde creatie van de IT-functie.

Vraag IT Volwassenheid
- Hoe belangrijk zijn data gestuurde processen en digitale transformatie binnen dit ministerie?
- Welke waarde hecht de bestuursraad aan IT binnen dit ministerie?

Verantwoordelijkheden: Onder verantwoordelijkheden verstaan we de domeinen en organisatie elementen waar de CIO zorg voor draagt. In de literatuur is gebleken dat de CIO voornamelijk verantwoording heeft in de domeinen: IT-strategie, portfolio management en het vergroten van IT-bewustzijn. We zien in de literatuur een toename van data, business intelligence en digitale transformatie.

Vraag verantwoordelijkheden

- Welke verantwoordelijkheden draagt de CIO op het gebied van verandering, digitalisering en de inzet van data binnen het ministerie?
- Heeft u enkele verantwoordelijkheden aan te vullen (in brede context)?

Optie - Sluiting: Fijn voor uw medewerking, graag verneem ik of u aanvullende input heeft die u wenst te vermelden in het teken van de departementale CIO.

Vraag sluiting

- Heeft u aanvullende input naar aanleiding van de gestelde vragen en/of onderwerpen?