



**Cem Dogan**  
Deloitte Consulting

# Executive Summary

Advances in information technology (IT) transform the role of IT executives and among them the role of the Chief Information Officer (CIO) since its incarnation in the 1980s. This article describes the current evolvement of the CIO role into a “technology architect.”

In this decade of the 2010s, the role of the CIO is constituted by tasks of increasingly integrating and configuring external IT resources besides acquiring and managing in-house IT resources. A theoretical framework is developed of the emerging technology architect CIO role based on analyses of 16 interviews with leading global CIOs.

We reflect decade-specific Information Systems (IS) research considering the CIO roles’ overall impacts, its tasks, and its contributions to the organization to reason and compare the CIO’s evolving role from the 1980s over the 1990s and 2000s to the 2010s.

# The Evolving Role of the CIO

The role of the CIO enters its fourth decade, successively changing over time. Outlining the future understanding of the CIO, this article is to be reflected on cloud computing, social media, mobility, and IT servitization.

The different incarnations of the CIO along the decades of the 1980s, 1990s, 2000s, and 2010s are categorized as follows.

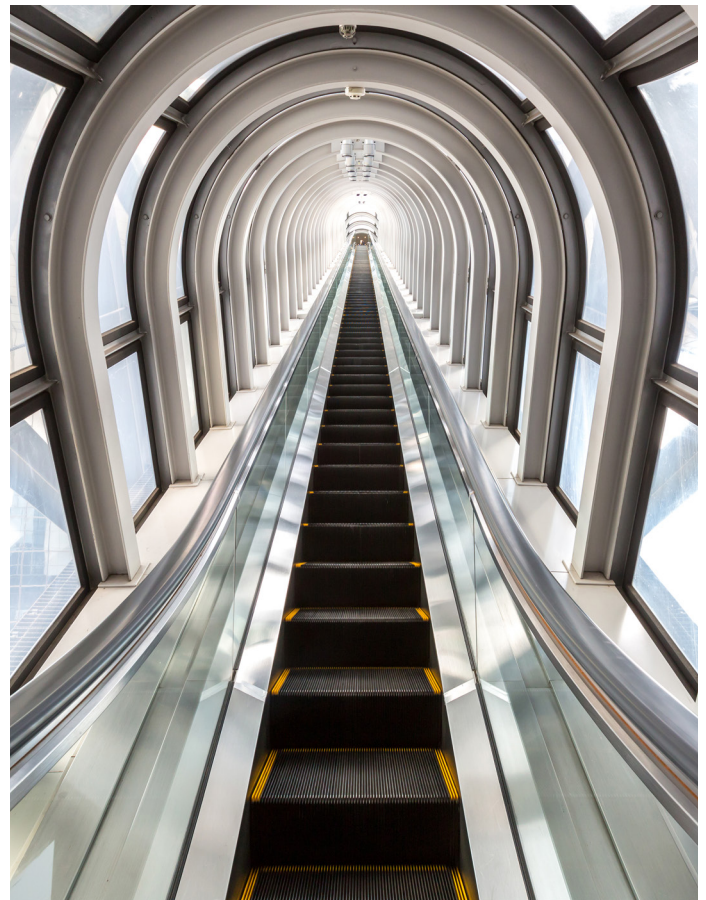
In the 1980s, the CIO emerged as a C-level executive responsible for establishing and managing the organization's IT department.<sup>1</sup> Associating the role closely with firms' IT facilities and basement data centers, the CIO was mainly a ***"technology developer"*** throughout this decade and closely responsible for programming IT infrastructures of the organization.

A decade later, in the 1990s, the CIO increasingly included business and service responsibilities in addition to technology. Aligning technology to business models became a central concern and classified the CIO as a ***"technology aligner"*** who understands the business. Internet technology became a critical business driver and made CEOs include their CIOs in helping to design and define new business models.

In the 2000s, close relations among CIOs and business units are observable due to massive initiatives in IS integration throughout organizations. CIOs become recognized as top executive team members. Operative technological responsibilities shift towards roles such as to Chief Technology Officers (CTOs). The CIO's position in the top management team as a ***"technology integrator"*** starts to increase both the effectiveness of how technology is used and how synergies are created within organizations, thus increasing overall company performance.

The current understanding of the CIO in the 2010s evolves towards a ***"technology architect"***. Rapid business changes and growths shift CIOs' responsibilities towards integrating externally available IT services, such as web services from cloud platforms, and creating holistic accessibility of available technology. Companies' technological competitive advantages are determined by their flexible use of IT resources, in order to scale existing and adapt new technologies, which can be achieved if IT knows what the corporate building blocks are and how they fit together.

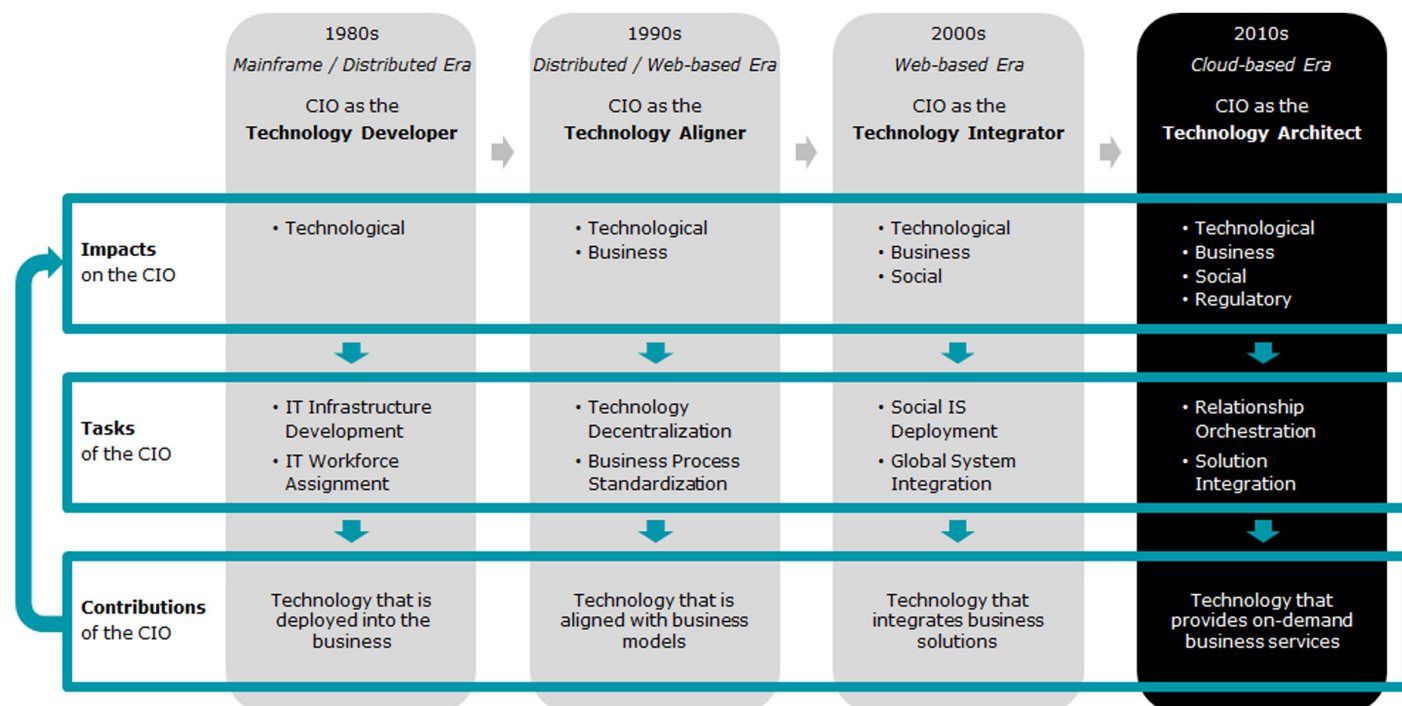
Reflecting the current and past three decades,<sup>2</sup> our research identifies four archetypical roles of the CIO and relates them to their 1) impacts, 2) tasks, and 3) contributions as illustrated in Figure 1. Based on these three dimensions, we contrast the characteristics of each evolved role with events in technology that occurred. Our findings regarding the CIO role of the 1980s, 1990s, and 2000s are based on the first part of our interviews, where we asked our interviewees what they ***"relate with the CIO function of the past three decades"*** (Appendix B), and backed up by academic studies. Our findings regarding the CIO role in the 2010s are based on a structured analysis of the qualitative data from the main interview parts using grounded theory.



<sup>1</sup> Rockart, J. F., Ball, L., and Bullen, C. V. "Future Role of the Information Systems Executive," MIS Quarterly (6:Special Issue), 1982, pp. 1-14.

<sup>2</sup> Ross, J. W., and Feeny, D. F. "The Evolving Role of the CIO," in Framing the Domains of IT Management, Zmud, R. W. (ed.), Pinnaflex Press, 2000, pp. 385-401: In the mainframe era that was "covering roughly the 1960s into the early 1980s [...], IT was largely synonymous with mainframe computers." In the distributed era that was "starting at the end of the 1970s [...], corporate IT became characterized by integrated networks of workstation PCs, mini-computers and mainframes, connected through local and wide area networks." The web-based era was "starting for most in the mid-1990s, with a rapidly growing emphasis on the use of internet and web protocols to drive both internally and externally oriented applications of IT."

Figure 1: Comparison of the CIO role over four decades between the 1980s and 2010s



### The CIO, a technology developer (1980s)

The CIO emerged from prior IT leadership roles in the early 1960s. After Apple launched its first home computer in the late 1970s, IBM released its first MS-DOS-based personal computer in the early 1980s. In the mid-1980s, Microsoft introduced Windows 1.0 while Technology started to attract mainstream awareness. As a **“technology developer”**, the CIO was dedicated to introducing technology to organizations by that time.

#### 1. Impacts on the CIO in the 1980s

While during the 1960s and 1970s the quantity of data processors to produce information was important, the quality of information became crucial for companies in the 1980s, as the mainframe era was maturing and the distributed era started to fade in. By that time, the impacts on the CIO were strongly

- Technological

#### 2. Tasks of the CIO in the 1980s

CIOs assigned decentralized IT managers for coordinating corporate data processing. They needed to be perceptive in managing IT teams and in communicating and transferring their technical competencies to them.<sup>3</sup> As a software developer himself and a manager of a technical team of developers, the CIO needed to be increasingly aware about building human relationships and assign responsibilities to his technical team. Their main tasks in the 1980s were therefore related to

- Developing IT infrastructure
- Assigning IT workforce

### 3. Contributions of the CIO in the 1980s

CIOs built the interface between the IT workforce and his organization’s executive management. As the leader of the corporate IT department, the CIO was taking both developer and manager activities. Still, executive management was lacking confidence in his strategic understanding and in technology in general. To get IT infrastructure established, the CIO’s main contributions to organizations in the 1980s were about

- Deploying technology into the business

### The CIO, a technology aligner (1990s)

In the early 1990s, the World Wide Web was invented, taking businesses online. After the invention of the web markup language HTML, the internet protocol HTTP, and the establishment of Wi-Fi as standard for wireless internet, the e-Commerce auction website eBay was launched in the mid-1990s. Within the same decade, today’s online payment system PayPal was founded. While firms started to assimilate web technology, a CIO’s business knowledge became a key success factor.<sup>4</sup> The CIO as a **“technology aligner”** emerged as he hence began to engage in aligning business models with technology.

#### 1. Impacts on the CIO in the 1990s

CIOs were exploiting new internet-based technologies, as the distributed era was maturing and the web-based era began. The adoption of decentralized information systems by companies due to emerging internet technologies increased the impact of CIOs on the business and vice versa. Companies started to announce

<sup>3</sup> Rockart, J. F. “The Changing Role of the Information Systems Executive: A Critical Success Factors Perspective,” Sloan Management Review (24:1), 1982, pp. 3–13.

<sup>4</sup> Armstrong, C. P., and Sambamurthy, V. “Information Technology Assimilation in Firms: The Influence of Senior Leadership and IT Infrastructures,” Information Systems Research (10:4), 1999, pp. 304–327.

official CIO positions from the late 1980s and early 1990s. This signaled an increased demand for the highest executive in IT as a C-level<sup>5</sup>. The main impacts on the CIO in the 1990s were

- **Technological**
- **Business**

## 2. Tasks of the CIO in the 1990s

CIOs' tasks in the 1990s shifted from developing IT infrastructure towards standardizing IT infrastructure to cover decentralized corporate locations. Being more business-focused, CIOs started to develop technology to enable business models while gaining more management know-how besides IS-skills. Influence on the top management team from IT side started to increase. Those CIOs who were within the executive board, possessed and developed better business knowledge. Deployment of standardized business processes to make an effective company-wide global use of IT became essential. Decade-specific study results show that more IT managers who became CIOs were having experience in managing non-IS-related functions. CIOs were mostly working on

- **Decentralizing technology**
- **Standardizing business processes**

## 3. Contributions of the CIO in the 1990s

In the 1990s, an increased integration of the CIO into the top management team is observed.<sup>6</sup> Having a strong business alignment and a common vision between business and technology became critical. CEOs began to realize that their CIOs started to have same managerial abilities as general managers, additionally possessed IT expertise, and became crucial to their success.<sup>7</sup> A better CIO-CEO relationship meant a better exploitation of IT as a strategic resource to enable business.<sup>8</sup> Main contributions of CIOs during that decade related to

- **Aligning technology to business models**

## The CIO, a technology integrator (2000s)

In the 2000s, internet and electronic data interchange (EDI) through the web matured. Component-oriented IS development through service-oriented architecture (SOA) started to rise and companies such as Amazon were starting to provide platforms to facilitate the use of web services. Deploying large Enterprise Resource Planning (ERP) systems across organizations becomes popular<sup>9</sup>. Economic events, which affect whole nations such as the introduction of the Euro currency, were resulting in stronger organizational needs to adjust those systems to maintain an integrated business flow. CIO's role was shifting towards a **"technology integrator"** who became increasingly dedicated to integrate different business solutions across his organization.

## 1. Impacts on the CIO in the 2000s

During the 2000s, as the web-based era matured, organizations' interests in using global ERP- and social information systems increased<sup>10</sup>. Popular social media platforms were invented in this decade such as LinkedIn, Facebook, and Twitter. CIOs enhanced company-wide communication through software such as MS Office Communicator, later known as Lync and Skype for Business. Social networking services for organizations such as Yammer were rising. The main impacts on the CIO in the 2000s were hence

- **Technological**
- **Business**
- **Social**

## 2. Tasks of the CIO in the 2000s

By increasingly integrating large ERP systems throughout organizations, CIOs needed to become smart buyers and to build strategic relationships with vendors and suppliers.<sup>11</sup> Facilitating organization-wide communication and helping to enhance business activities with integrated global system deployments, CIOs gained more privilege and influence than ever in organizations and got increasingly involved in strategic business planning issues<sup>12</sup>. The main CIO tasks in the 2000s are summing up to

- **Integrating global systems**
- **Deploying social IS**

## 3. Contributions of the CIO in the 2000s

Increasing direct contact with CEOs made CIO roles become crucial to organizations' integrative business strategies in order to exploit system integration across the business. CIOs were even becoming potential candidates for the CEO's job. It became tremendously important that they engaged in strategic partnerships with major company-internal leaders and external vendors to effectively deploy and integrate large ERP systems and assure user acceptance of deployed business solutions throughout an organization. CIOs' corporate contributions in the 2000s were mainly about

- **Integrating business solutions**

<sup>5</sup> Chatterjee, D., Richardson, V. J., and Zmud, R. W. "Examining the Shareholder Wealth Effects of Announcements of Newly Created CIO Positions," MIS Quarterly (25:1), 2001, pp. 43-70.

<sup>6</sup> Applegate, L. M., and Elam, J. J. "New Information Systems Leaders: A Changing Role in a Changing World," MIS Quarterly (16:4), 1992, pp. 469-490.

<sup>7</sup> Feeny, D. F., Edwards, B. R., and Simpson, K. M. "Understanding the CEO/CIO Relationship," MIS Quarterly (16:4), 1992, pp. 435-448.

<sup>8</sup> Gupta, Y. P. "The Chief Executive Officer and the Chief Information Officer: The Strategic Partnership," Journal of Information Technology, 1991, pp.128-139.

<sup>9</sup> Deloitte, "ERP's Second Wave: Maximizing the Value of Enterprise Applications and Processes," Deloitte Consulting LLC, 1999, pp. 1-28.

<sup>10</sup> Schlagwein, D., Schoder, D., and Fischbach, K. "Social Information Systems: Framework, Review, and Research Agenda," Proceedings of the International Conference on Information Systems (ICIS), 2011.

<sup>11</sup> Willcocks, L. P., and Sykes, R. "The Role of the CIO and IT Function in ERP," Communications of the ACM (43:4), 2000, pp. 32-38.

<sup>12</sup> Leidner, D. E., and Mackay, J. M. "How Incoming CIOs Transition into their New Jobs," MIS Quarterly Executive (6:1), 2007, pp. 17-28.

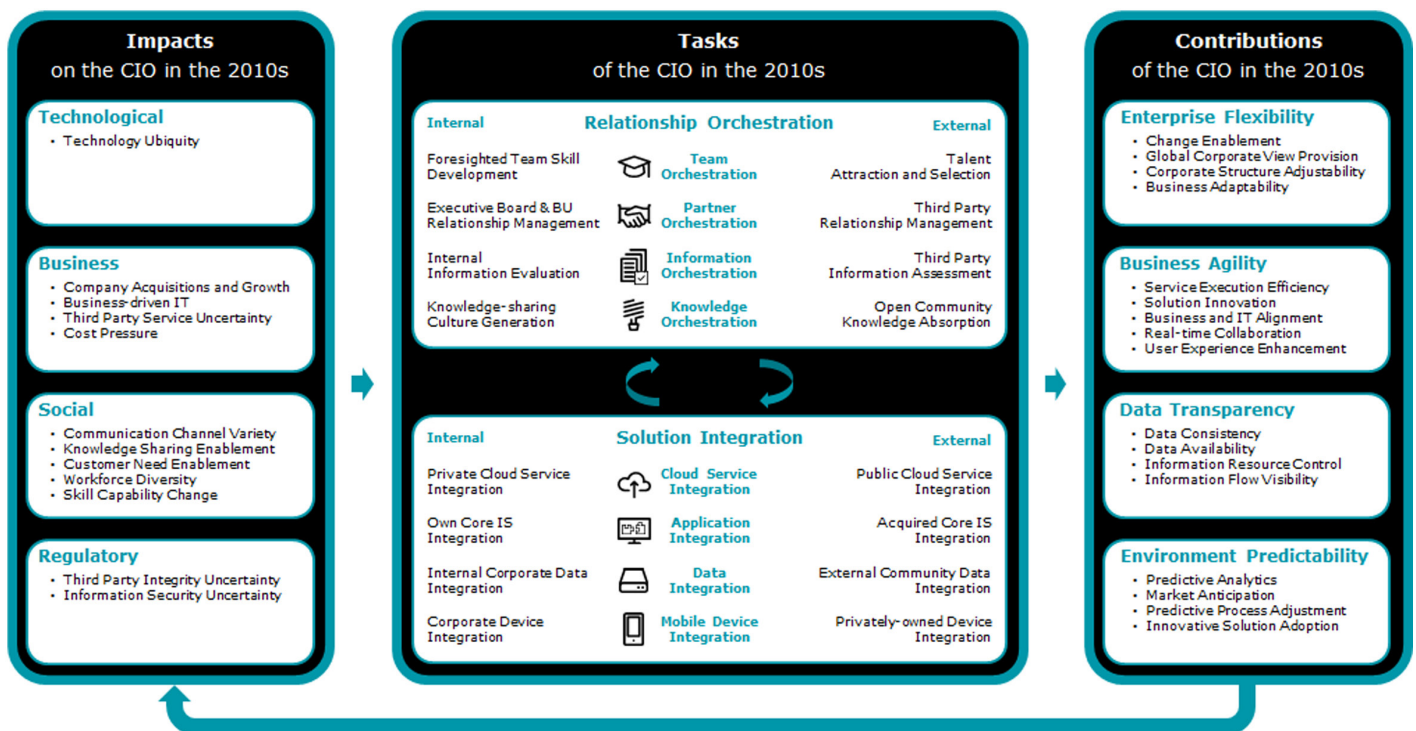


### The CIO, a technology architect (2010s)

In the 2010s, cloud platforms such as Microsoft Azure, IBM Smart Cloud, or SAP HANA Cloud Platform are introduced. Beyond SOA, microservices gain popularity. The decade of the 2010s is to be described as the “cloud-based era” with cloud computing as the next stage of evolution in IT.<sup>13</sup> Strongly engaging in cloud technology adoption, CIOs combine emerging on-premise and cloud solutions throughout the company. The orchestration of vast amounts of decentralized IT resources make the CIO evolve into the “**technology architect**” role (Figure 2).

Our CIO partners we spoke with in our research generally see their current role become much more related to integrating business units through cloud technology solutions across corporate boundaries. Enabling this is a unique ability which distinguishes the CIO from its past roles, as pointed out by one of our interviewed CIOs from a large Swedish Postal Service company: “There needs to be someone in the company who understands how things fit together and [who], especially in the cloud environment, [...] understands how to puzzle things together.” (10)

Figure 2: Impacts on, tasks, and contributions of the CIO in the 2010s



#### 1. Impacts on the CIO in the 2010s

Within the cloud-based era, the CIO increasingly faces uncertainty regarding data security, interruption of data availability, compliance and legal issues, and risks of losing control over stored data.<sup>14</sup> In times of lowered barriers for obtaining IT services through cloud adoption, “**regulatory**” impacts on the CIOs’ tasks and responsibilities become especially relevant in the 2010s,<sup>15</sup> besides “**technological**”, “**business**”, and “**social**” impacts.

“**Technological**” impacts relate to IT’s self-conception nowadays. “People in the office have become much more IT-savvy themselves. People are having computers at home; people are having internet access at home, while having all kinds of smartphones and tablets etc.” (4) “People just expect a lot of technology to be there.” (13) For example, “the supply chain is all

becoming electronic.” (1) “**Technological**” impacts are observed through:

- **Technology Ubiquity**

“**Business**” impacts relate to forces on a company’s day-to-day business. Companies are “the product of a rapid set of acquisitions and some consolidations of some companies.” (13) It is “sometimes very challenging with rapid growth because you’re not handling just one company.” (2) “The impact is that we [CIOs] are more and more embedded in the business [...]. I think the way I see the IT role evolving is that it will be more embedded in the business [... and] I would say I spend 60 percent of my time with the business.” (5) “The purpose of IT is really driven by the business. So I would say the number one thing is to link with the business partners, and if they are supportive, if they are leading,

<sup>13</sup> Gartner, “Hype Cycle for Cloud Computing,” Gartner Inc., 2011, pp. 1–74.

<sup>14</sup> Deloitte and CIOnet, “Cloud Adoption Study: Cloud computing is gaining momentum,” Deloitte NWE LLP, 2011.

<sup>15</sup> Deloitte, “The 2010 CIO Compass: A field guide to practical IT strategy and planning,” Deloitte Development LLC, 2011, pp. 1–128.

it is easy. If they are not leading, every business project that is driven by IT becomes a nightmare if it is only driven by IT. It should really be driven by the business.” (3) It is “important for CIOs to be able to manage [...] a much deeper knowledge of the suppliers and their capabilities, their technology direction, [and] their investment decisions.” (15) The uncertainty with third parties is related to “the intention of the service providers [that they] always [try to] increase their margin by reducing level of service, [and] increasing costs.” (12) “IT is related to costs, but we have to optimize, to reduce the costs, to optimize the organization and to simplify everything.” (7) “Today higher IT costs are always seen as a bad thing, but that will not be the case in the future [...] as the] CIO needs to be measured on revenue instead of costs, so that is one big change and that will also bring the CIO closer into the business of course.” (10) “Business” impacts are observed through:

- Company Acquisitions and Growth
- Business-driven IT
- Third Party Service Uncertainty
- Cost Pressure

“Social” impacts relate to connecting people and leverage communication through IT. “In regards to online communities and social collaboration and social communication, to me that is a very important aspect for talent attraction and talent retention.” (16) As “an extended enterprise [...] where] we cannot imagine that in social networks we give the services only inside the company but it must communicate outside the company.” (7) “People are holding extremely on their asset [...] and] it’s basically [that] people try to secure their job or tend to secure their job by protecting their knowledge and not sharing it.” (2) “We should be selectively sharing [knowledge] depending on the needs of the business.” (14) “How do we make a difference with the customers on the way he deals with the company?” (5) “When you have [an internal] customer that says ‘that is what I want or what I need to deliver my services to my customer’, when this is a requirement, we are used to manage this kind of demand.” (6) CIO’s questions are “getting more and more to how is benefiting the customer.” (10) “People are in their fifties and they are not very keen with these new technologies [...] and] we are hiring people who are born in the 80’s and 90’s and they do not understand [that].” (5) “Cultural differences and communication [...] are] the biggest challenge[s] I have, where I’m sometimes more or less a moderator between the different cultures in order to get people back again on one table internally within my department.” (2) “People are different. Some prefer to not watch each other when they’re at a meeting, especially across geography.” (15) You are “seeing a lot of the workforce changing, although it is much slower in the industry segment than it is in an e-commerce segment.” (13) “If you look in the organizational chart five or even ten years ago [...] you see some of the different structure in the organizational chart and the different types of people in there.” (4) “Social” impacts are observed through:

- Communication Channel Variety
- Knowledge Sharing Enablement
- Customer Need Enablement

- Workforce Diversity
- Skill Capability Change

“Regulatory” impacts relate to uncertainties in dealing with third parties from which (cloud) services are used. The question is how to make sure “the supplier is not providing data to a competitor?” (3) “How do you want to control your internal secrets, if everybody is leaving messages in a tool from the vendor?” (2) “Security is becoming more and more important lately, since we got all these attacks from some governments in the east side of the world [...]. I mean security is going to be very important in the future because as we are going to share more and more, we need to make sure we know what we share, we track it and we protect what we can.” (5) “The challenge usually is protecting intellectual property.” (1) “You can imagine if you’re acting around the world with thirty companies, you need to make sure that your intellectual property is not leaking too much.” (2) “Regulatory” impacts are observed through:

- Third Party Integrity Uncertainty
- Information Security Uncertainty

## 2. Tasks of the CIO in the 2010s

As the two main task groups, “relationship orchestration” and “solution integration” emerge from the collected data. The CIO’s emerging task types, that our interviewees reported, show a significant orientation beyond corporate boundaries. We therefore distinguish between an internal and external dimension of the CIO’s tasks in the 2010s.

### 2.1. Relationship Orchestration

From our analyses of the data, “relationship orchestration” covers four sub-tasks “team orchestration,” “partner orchestration,” “information orchestration,” and “knowledge orchestration.” This part highlights CIOs’ increasing needs to manage interpersonal relationships and exchanged information with different human parties.

“Team orchestration” refers to existing and new team members. “The teams will be much more like any other business team. That also means [...] they will be managed as the CIO, not only on the costs, but also on the revenue.” (10) “You will start to see [...] more and more people, which are in the technology role, will start spilling over into the business.” (13) The CIO’s team will be “building the bridge between information and technology and other functions and other business units.” (4) At the same time a CIO needs “to prepare [...] his] company to better attract [...] talent[s] and not be, let’s say a grey mouse or a big anonymous company where you come to the office, work at your desk and go home at five. This is not what the younger generation [generation Y] is looking for.” (16) His “job is to make sure he can find [for example] the best cloud architects to work in the organization.” “We need to attract them [new talents] and make sure we’re going to retain them and show that we are adaptive, modern, and ready with new technologies.” (5) “Team orchestration” consists of:

- Foresighted Team Skill Development
- Talent Attraction and Selection

**“Partner orchestration”** is about actively building trusted and close relationships with the internal customer and *“a close relation with the top management”* (7) as *“our [the CIO’s] role will be [...] more and more [evolving to] the internal partner to the business that understands their processes [...] and transformational needs.”* (16) Furthermore, maintaining good relationships with third parties relate to *“the role of corporate IT [which] will become a lot more outsourced and the CIOs [...] will be the ones that are managing the external partners to do the services that used to be done by an internal IT department.”* (8) *“You are not acting as a company by yourself but you are deeply integrated into an eco-network or into an eco-system.”* (9) **“Partner orchestration”** consists of:

- **Executive Board & Business Unit (BU) Relationship Management**
- **Third Party Relationship Management**

**“Information orchestration”** covers evaluation of the use of existing information inside the company and information provided by other sources. In terms of supplier-managed cloud storage, *“there is really a trade-off to do and it probably depends on the criticality of the information.”* (3) *“You have to be smart in deciding on where you want to put priorities and what you want to give outside. What you think is core to the business, what has really an impact to the business model.”* (9) *“There is still the need for a CIO role that would evolve to take that understanding of what the suppliers [...] are capable] to do, to make sure they’re orchestrating the services.”* (15) *“When you work with a provider, we look for technology and of course you have to identify the level of this provider to contribute to your goal.”* (7) *“Basically we make sure with them [our internal service provider] that we are having a strict project approach on identifying which companies are really worth bringing into a shared service – IT shared service.”* (2)

**“Information orchestration”** consists of:

- **Internal Information Evaluation**
- **Third Party Information Assessment**

**“Knowledge orchestration”** is about accessing and distributing knowledge. CIOs need to *“use a couple of technologies to encourage collaboration [...] You have to create an environment that makes it compelling for people to want to use them [collaboration tools like Salesforce Chatter, Yammer, MS Instant Messenger] because it makes their job more effective [...] and] easier.”* (15) *“If you want innovation, you should foster a culture in the company that benefits [from] innovation.”* (10) To leverage innovation one should *“encourage ideation [idea generation] coming from anybody, whether it’s from my internal employee base or maybe a customer or maybe an end consumer. Depending on that feedback, if one with a problem statement is coming, we try to build an innovation around that.”* (14) *“Of course, we also make use of [...] the usage of the social tools, etc. We certainly use the sources from the internet and also we use different groups there who are collaborating, because then we can figure out what is their way of thinking.”* (9) Further product insights can be gained for example from *“expert social networks [with “cooperation partners, market research companies”].”* (9) **“Knowledge orchestration”**

consists of:

- **Knowledge-sharing Culture Generation**
- **Open Community Knowledge Absorption**

## 2.2. Solution Integration

The **“solution integration”** tasks cover the sub-tasks **“cloud service integration”, “application integration”, “data integration,”** and **“mobile device integration.”**

**“Cloud service integration”** is about adopting private, public or hybrid cloud services. *“To some degree we [CIOs] can look a little bit like system integrators. We are plugging together various cloud services for example so there is an integration- and architecture component [...] to that.”* (13) *“We run our HR system out of the cloud, we are doing desktop virtualization which is in our private cloud, which means we are running it out of our data center.”* (8) *“More and more companies start to use cloud type of solutions, and all kinds of cloud models like hybrid models [...]including] in-house, external, and outsourced, so [...] CIOs] become much more the architects [...], much more the people that make sure that it all works together, [...] to] have sufficient strong processes, that things are connected and identical and consistent.”* (4) *“There will be more software as a service [...]. It’s going to be faster, if you get the solution from an external provider than from the internal IT.”* (5) *“Companies are already moving out the traditional model and looking at specialist companies to provide the same services at a higher level of quality and a lower cost.”* (8) *“Going to a service model, especially if we’re consuming services from external providers, I believe it’s the right direction to go.”* (15) **“Cloud service integration”** consists of:

- **Private Cloud Service Integration**
- **Public Cloud Service Integration**

**“Application integration”** refers to providing entirely integrated and scalable landscape of corporate IS. *“Many of the companies in industry have implemented a whole series of different technologies as point-solutions [...]. I think the next big step is how to create a truly integrated information portal where you don’t have the way Salesforce wants you to access their technology and then the way SAP wants, and they look radically different.”* (15) *“The problem will come some years after, when the guys [from one’s company] have used the purchased software and then they want to integrate it.”* (5) It *“will be [...] more [about the] configuration and architecture in terms of how to connect those various systems together.”* (13) It also includes proper integration of newly acquired companies into the existing IS landscape *“to support this from an IT perspective buying new companies, integrating them into the current company, building up new system platforms, merging together things.”* (10) Many companies are *“a product of acquisitions [and] we’ve got a lot of duplicative systems that are actually getting in the way of the process because we can’t move freely across the companies [...]. The challenge for me is to be able to bring them [the ERP systems] onto one platform.”* (13) **“IS integration”** consists of:

- **Own Core IS Integration**
- **Acquired Core IS Integration**





**“Data integration”** relates to integrating corporate data sources and data outside the own corporate structures. *“I am really trying to integrate the entire sources of information that my customers need, and make it easier for them to consume.” (15) “It’s the CIO’s responsibility and CIO’s agenda to create this data to information. If you convert this data into meaningful information, which can be used to analyze and prepare for any situation or any eventuality, this can be a great value for any business.” (14) “You should [also] try to connect data from maybe social media and point of sale type of sources [...]. You should try to connect all that data and do something with it and analyze it coherently.” (4) “The CIO will have to build a close connection with the social media and maybe the other community services, mainly to get the pulse of the market, how the market is feeling, which could be the change in the market to create improvement plans.” (14) “Data integration” consists of:*

- Internal Corporate Data Integration
- External Community Data Integration

**“Mobile device integration”** is about integrating company- or privately owned portable devices. *“What will happen with IT in the coming five years is that you will see lot less corporate applications. No one would supply corporate laptops anymore. Everyone will take their own laptops to the job. You already see that today [...] so people will be choosing their own tools.” (10) “[Innovation relates to] adopting a much stronger mobile strategy to mobilize the workforce [...] while] embrace[ing] social mobile strategies as part of your IT strategy.” (16) CIOs “expect to be able to have bring-your-own-device kind of delivered email [...] and preferably use two or three different devices.” (4) “Everyone is going to buy their own tablets until such time that a tablet can replace a PC, and I don’t need to buy [one to] you.” (11) “We have an intense mobile strategy in place with a lot of bring-your-own-devices for example. And this is also why I’m personally leveraging the*

*social networks to involve them and also get feedback for us.” (16)*

**“Mobile integration”** consists of:

- Corporate Device Integration
- Privately-owned Device Integration

### 3. Contributions of the CIO in the 2010s

The above described tasks lead to four principal contribution areas of the CIO in the 2010s. In his evolving role to the technology architect, CIOs provide interconnected solutions to their companies. We clustered four contribution areas provided by CIOs which are **“enterprise flexibility,” “business agility,” “information transparency,”** and **“environment predictability.”**

**“Enterprise flexibility”** describes the CIO’s contribution to agility in corporate change- and transformation, possessing and providing the holistic view on corporate structures. *“The business is changing rapidly, the requirements from the business are changing every day [and], our market is changing every day.” (2) “I was generally brought in to transform. Take the organization and completely turn it around to something completely different.” (1) What “the CIO needs to manage and needs to embed is the transformational aspect [...] of] businesses, the lines of businesses, the plans, changing business models, new processes, transformational things.” (16) “You need to be more in the driver-, transformation role. [...] The CIO] is really helping the business to transform. Transformation in terms of getting all the things executed. Plus, usually the CIO and the capabilities of the CIO organization in a company are very much project-driven where you can really make the changes happen.” (9) CIOs “are at an ideal position as a change agent for the organization, because what [...] CIOs] see is how business processes are developed.” (13) Companies “need the guy who can consult the business, who fully understands the business model, who can drive information, who can drive*

transformation programs on a global scale.” (9) “We [CIOs] have the information from all the areas, all the functions and businesses. We have a vision that is pretty rare in a company [...]. Now it’s more that we are their partners who first understand the business processes, launch the business processes as well, because of the vision we have, broader than many other guys.” (5) “It will be about building bridges, so [about] people that are able to connect the information management world with business processes.” (4) “The role of a CIO or his core team [... is] to make the right choice for the enterprise to construct it correctly and maintain its power.” (14) **“Enterprise flexibility”** consists of:

- Change Enablement
- Global Corporate View Provision
- Corporate Structure Adjustability
- Business Adaptability

**“Business agility”** describes the agility in executing day-to-day business-related services, for example “to provide tools that will help the sales guys be more efficient on the field.” (5) “[With the] tools we have to deliver, [we want] to improve our own people’s efficiency.” (6) “I’m leveraging the ability to ramp-up or ramp-down, based on my needs of the third party.” (11) To foster business innovation “you need to go out and [e.g.] drive with the mail men.” (10) We “have to sit with the business and understand what they are doing and what their challenges are and then look for solutions.” (13) The “business must define what they want to, in which way they see the future [...], in which way the services will change and the kind of service model that will change.” (8) What the “CIO has to begin to do is to align [... his] technology strategy with the strategy of [... his] major partners.” (15) It “becomes more and more important to be able to report [...] in real-time.” (4) “Technology will be very disruptive in the way it contributes to the business [which] will be real-time and video.” (5) [In the future, the relationship among corporate entities is going to be] “real-time, always connected, always accessed, always available collaboration between all players.” (8) “People expect to have an experience at work that is so much more similar to their experience at home.” (4) “So the big innovative stuff now is trying to remake the customer service with IT tools to make the customer experience greater for the user.” (10) “It’s going to be more about the experience with the product than [just about] the product.” (1) “Voice recognition [...] is] about user experience, all what I’m talking [...] so] user experience which will be a big disruptive thing.” (5) **“Business agility”** consists of:

- Service Execution Efficiency
- Solution Innovation
- Business and IT Alignment
- Real-time Collaboration
- User Experience Enhancement

**“Data transparency”** relates to accessing relevant data and making it visible for usage. “Our role is to become more the guy who understands the data, the consistency and the global view of all data, what it means [...]. We will have a role to make sure the data stays consistent and we have a good dictionary and we know which data have to be considered in a different context.” (5) “We get better at defining master data management standards, so that we know that

things that [...] have a certain name in one system and another name in another system, that we start to harmonize that more and more, so it makes it easier to connect different datasets.” (5) “Basically the main responsibility of a CIO is to make sure that the lights are on, that the risks for the company, in terms of loss of data, in terms of availability of data, [...] are controlled.” (2) “Keeping the lights on [is one of the CIO’s key responsibilities], whatever is infrastructure like the network, the computer, whatever is becoming a commodity.” (5) “When I talk to a manager or a senior manager or director, they are typically not worried about individual transactions, but they want to understand what’s going on regarding how many transactions [...] and] how many purchases [...] have a purchase order, and how many don’t.” (4) We need to “make sure we think about things in terms of information streams. Where does the information flow? Where and what are the sources and the core systems of the information [...] and that] it’s changing to be less about technology and more about orchestrating the information flow in a company.” (4) “We are in a unique position to architect how those business processes flow, and optimize those, and create new business models.” (13) “We are the ones that clearly understand how the data flow looks like, where is the data managed and things like that.” (16) **“Data transparency”** consists of:

- Data Consistency
- Data Availability
- Information Resource Control
- Information Flow Visibility

**“Environment predictability”** describes the observation of trends and insights. “The new CIO needs [...] to] help the business through business analytics grow more revenue.” (1) “It is [about] how we take that information and leverage it through analytical tools that are going to be the differentiating factors for corporations in the future.” (11) You need to “take a look at the data in a different way so that you can start to spend more energy around predictive analytics, looking forward to help shape action [...] based on historical data and predictive analytics.” (1) “If you don’t anticipate the market change and the business change, you can face a situation in which you are not at the right level of competencies and you cannot provide the value need for the company.” (7) The CIO “can actually draw the blue prints for the execution of the tomorrow’s business.” (14) “The CIO has to decide what makes sense based on the next three to five years and steer IT accordingly, and push it in the right direction.” (12) It is about having “an end-state vision [...], to think [...] on a structured basis to say for each system: this is where we want to be from now.” (4) “One of the big challenges of innovation is [that] people look at it as a career risk opportunity: ‘if I try this innovative approach and it doesn’t work, then we are going to get killed here.’ Well, you’ve got to protect these people.” (1) “It’s [about] how you get to being able to get the innovation adopted.” (15) “You have to impress them, that the ideas that you’re proposing will improve the way they do their work.” (15) “By word of mouth, people start to adopt [the technology].” (5)

**“Environment predictability”** consists of:

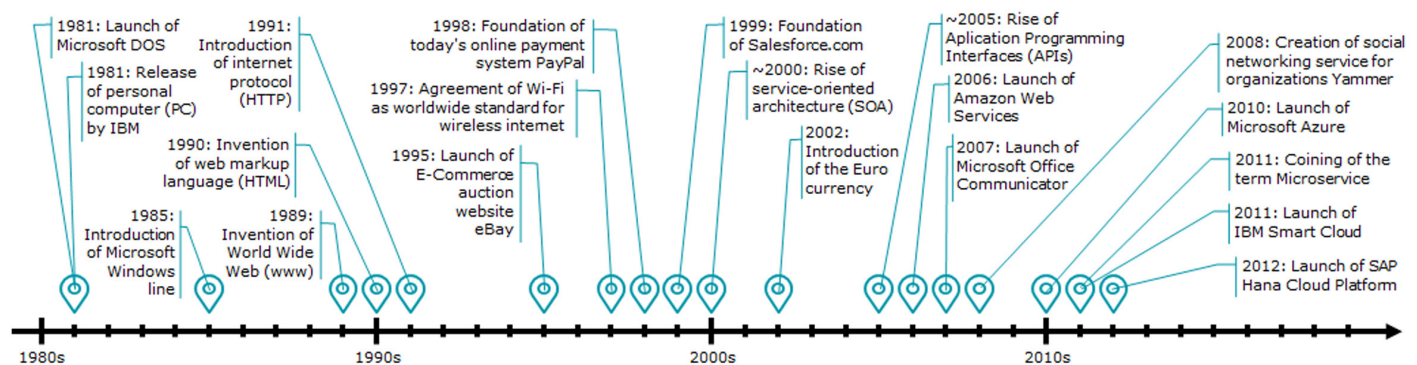
- Predictive Analytics
- Market Anticipation
- Predictive Process Adjustment
- Innovative Solution Adoption

### Concluding Comments

Evidently, the role of the CIO is evolving since it emerged in the 1980s. We theoretically reflect the past roles that CIOs generally took throughout each decade and contrast events that affected organization's use of technology (Figure 3). Observing fundamental technological changes, which affect the impacts on, tasks and contributions of the CIO, our analyses of 16 interviews with global CIOs make us able to define the current role of the CIO in the 2010s. Particularly, the CIO had the role of a *"technology developer"* in the 1980s, the role of a *"technology*

*aligner"* in the 1990s, and the role of a *"technology integrator"* in the 2000s. In the 2010s, he takes on the role of a *"technology architect."* The CIO remains the most dominant IS-related position in organizations. His role has evolved significantly over the past four decades, and is likely to evolve further in the future. Our results conclude a general observation and a simplified view within the limits of our research. In specific cases, we do not exclude that some roles, that CIOs had, differed from our decade-specific classifications.

Figure 3: Timeline over four decades with events affecting organization's use of IT



### Acknowledgement

We highly thank our interview partners for their valuable time during the interviews. By sharing their vision regarding the future CIO role, each CIO helped us to understand in which direction the CIO role is evolving and made therefore an important contribution to our findings.

### Appendix A: Research Method

For this study, we conducted key interviews with 16 leading CIOs across the globe regarding their understanding of the CIO role in past decades and their vision of the current and future CIO role. We backed-up our findings by academic studies on the CIO role dating from the different decades. Using a structured literature analysis, we described the past three roles of the CIO. For that, we considered published IS literature as well as published practitioners' sources and books from the 1980s, 1990s and 2000s regarding the CIO role. This review allowed us to provide a summary of the actual tasks of the CIO as well as the conceptualization of the CIO in the respective past decades.

We then analyzed our interviews to develop and describe the currently emerging role of the CIO in the 2010s. We used the grounded approach from Nag<sup>16</sup> clustering interview data to meaningful sense parts pioneered by Strauss and Corbin<sup>17</sup> and additionally consider the recent constructivist enhancements of the approach by Charmaz<sup>18</sup>. Table 1 provides an overview of our interrogated CIO interviewees. We ended our data collection at the point during which theoretical saturation has been reached and no more new insights through new insights were found even after our theoretical sampling approach, where we selected samples that are diverse in different criteria such as location, industry, size, country, and the CIO's length of appointment.

Table 2 exemplifies Nag's approach to the interview quotes, which we coded under the so-called first-order category *"User Experience Enhancement."* Together with (four) further first-order categories, they are clustered into the second-order theme *"Business Agility,"* a sub-domain of the aggregated dimension covering the contributions of the CIO in the 2010s.

<sup>16</sup> Nag, R., and Gioia, D. A. "From Common to Uncommon Knowledge: Foundations of Firm-Specific Use of Knowledge as a Resource," *Academy of Management Journal* (55:2), 2012, pp. 421–457.

<sup>17</sup> Strauss, A. L., and Corbin, J. M. "Basics of Qualitative Research: Grounded Theory Procedures and Techniques," Sage Publications Inc., 1990.

<sup>18</sup> Charmaz, K. "Constructing Grounded Theory: A Practical Guide through Qualitative Analysis," Sage Publications Ltd, 2006.

**Table 1: Background of interviewed CIOs**

Company	Function	Industry	Size	Country	Tenure as CIO
(1)	CIO	Oil & Gas	> 50,000	USA	6.7 years
(2)	CIO	Hearing Instruments	> 1,000	Germany	7.7 years
(3)	CIO	Mechanical or Industrial Engineering	> 50,000	France	5.9 years
(4)	CIO	Chemicals	> 50,000	Netherlands	8.4 years
(5)	CIO	Electrical / Electronic Manufacturing	> 100,000	Switzerland	7.3 years
(6)	CIO	Engineering / Technology Consulting	> 10,000	France	0.1 years
(7)	CIO	Engineering / Technology Consulting	> 10,000	France	9.4 years
(8)	CIO	Oil & Energy	> 1,000	USA	7.1 years
(9)	CIO	Mechanical or Industrial Engineering	> 10,000	Switzerland	13.8 years
(10)	CIO	Postal Service, Courier	> 10,000	Sweden	12.7 years
(11)	CIO	Food Production	> 10,000	USA	6.0 years
(12)	CIO	Engineering / Technology Consulting	> 1,000	Germany	1.3 years
(13)	CIO	Oil & Energy	> 1,000	USA	1.0 years
(14)	CIO	Outsourcing / Offshoring	> 1,000	India	9.7 years
(15)	CIO	Electrical / Electronic Manufacturing	> 100,000	USA	14.0 years
(16)	CIO	Enterprise Software	> 50,000	Germany	3.3 years

**Table 2: Scheme for Constructing the Grounded Framework of CIO Role in the 2010s**

First-order Categories	Second-order Theme: Business Agility Contribution	Aggregated Dimension
User Experience Enhancement	<i>"It's going to be more about the experience with the product than the product [...]. It happened to be manifested itself into the device. I think that's what everyone is trying to do is, make their product an experience [...]. So I think you are going to see more and more IT guys moving into product things, trying to help them with that." (1)</i>	Contributions of the CIO in the 2010s
	<i>"That even has accelerated to where people expect to have an experience at work that is so much more similar to their experience at home [...]. So it's up to the IT department and to the CIO to make sure that the experience for [... our company's] employee is coherent and is consistent." (4)</i>	
	<i>"Voice recognition [... is] about user experience all what I'm talking. You could categorize that under user experience which will be a big disruptive thing." (5)</i>	
	<i>"So the big innovative stuff now is trying to remake the customer service with IT tools to make the customer experience greater for the user." (10)</i>	
< First-order Category Name 2 >	...	
	< "Text part from transcript of interview with CIO 1" (1) > < "Text part from transcript of interview with CIO 2" (2) >	
...	...	
First-order Categories	Second-order Theme: < Second-order Theme Name 2 >	
...	...	



## Appendix B: Interview Questions

### 1. About the CIO Participant

- How is your personal history related to your tasks and responsibilities within your current CIO position?
- What do you relate with the CIO function of the past three decades?
  - 1980s, 1990s and 2000s
- What are current trends and will be main tasks of CIOs in the future?

### 2. Opinion on Opening up Information Generation Processes

- What is your personal opinion about opening up information- and communication technology (ICT) management processes to external service providers (Pro & Contra)?
- How would you involve online communities and social networks?
- How should the internal IT environment be managed and considered in this context?
- To which extent would it be possible for you to max out the highest benefit by integrating external services?

### 3. Management of Different Information Spheres

- Appropriateness of opening and externalizing at the same time
  - Opening: Will there be an access limit to company data (open vs. closed)?
  - Externalizing: How should company data be provided (external vs. internal)?
- Will there be a time when firms have to also externalize IT which is strategically related to business and how could CIOs manage this development?
- In which way could the CIO's utility be questioned in the future if everything is provided as a service?
- How is your function going to or would develop in times when more and more software, infrastructures and platforms are provided as a service?
  - Tasks, Responsibilities, Relation to Executive Board

### 4. Relation to Collaboration Partners of the IT Management Environment

- Internal staff
  - In which way should they be managed to enable the highest value, added to a company, while benefiting from more and more external services?
- Online communities
  - Which degree of involvement will online communities have in a company for value generation through IT and be treated regarding their integration?
- External service partners
  - What would be a good way to integrate external service providers to manage the organization's daily IT needs in the future?
  - In which way will you manage your relations with their external service providers?

## Contact

For more information about this paper, please contact:



### Cem Dogan

Deloitte Consulting  
Technology Strategy & Architecture  
cdogan@deloitte.com

Cem Dogan serves as a Project Leader at Deloitte focusing on IT strategies and operating models.



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