Roles and responsibilities of modern CIO – status and analysis of trends in Croatia

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Abstract.

Article describes historical development of CIO (Chief Information Officer) function and the course of changes in their roles and responsibilities. Scientific literature sources were analyzed as well as existing CIO development competence models (SFIA, EUCIP, IRMA). These de facto standards are then mapped together making cross section for CIO BoK (Body of Knowledge) – core competencies, presented through main areas of CIO-s business value: demand and supply of IT/IS function. The results of research made in Croatia by means of CIO survey were presented. They include CIO demography and related companies key figures, education, roles and responsibilities in business systems and their expectations and potentials. Conclusions on existing status were made as well as recommendations of further steps in improving CIO's development.

Keywords. CIO, roles and responsibilities, IRMA, EUCIP, SFIA, Body of knowledge, Mapping.

1. Introduction

CIO (Chief Information Officer) is relatively new part of ICT management. As the role of ICT and IS within business organizations has grown in importance, the role of that management function has also changed. In this regard, are the transformations in CIO's activities, responsibilities and competences, as well as the necessary education contents. The goals of this article were: 1.) establish the way of changes in the CIO roles and responsibilities, 2.) identify the existing models for determining the CIOs competencies and to generate the framework for BOK, 3.) examine and look into the Croatian CIO practice and 4.) to recommend the following necessary improvements and research.

2. Literature review

Combining literature review and our own practical experience in CIO roles, it is obviously that during the time this function was strongly changed. From the beginning of this job till now, there ware 3 waves. In addition, the fourth wave comes.

2.1 The first wave

At the beginning of data processing era in 1960s the original IS manager role was a relatively unimportant Electronic Data Processing Manager (EDP). At that time its role was entirely technologically oriented. His/her position was to supervise how the "wheels are turning", while decision on huge investment in EDP equipment and its subsequent application was entirely in the

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hands of company's top management. This was comparable to the situation when manual labor was replaced by steam engines: there was no internal qualified and credible technical staff, which could advise top management on such added value by EDP to the business. To today's "digital natives" this strange situation can brought closer by explaining that only 20 years passed after famous statement: "'I think there is a world market for maybe five computers!" (Thomas Watson, Chairman of IBM, 1943) [12]

2.2 The second wave

At the end of 1970s *occurs* expression MIS manager. He was also primarily a technical manager, but already with some business relative responsibilities . A study of MIS [11] found strong differences in the role of MIS executives, *in regards to EDP manager,* related to two of the IS functions: (1) operations, a closed and stable, and mechanistic environment that required the use of formal policies and procedures, and (2) development, an open, adaptive, and organic environment where managers had to function in a flexible, decentralized, decision making, and autonomous mode. In 1980s there were four critical success factors for IS executives [13]:

1. *Service* – ensuring the effective and efficient performance of the IS and creating positive user perception of IT operations;
2. *Communication* – understanding the world of key users and top executives and helping them understand the IS environment;
3. *IS Human Resources* – assisting executives in finding IS talent to develop and use information data bases; and
4. *Repositioning the IS function* – managing the technical, organizational, psychological, and managerial aspects of the firm's IS.

2.3 The third wave

The title of CIO was introduced in the mid-1990s to describe a new type of IS executive. The earlier role had transformed heavily from technical manager to business capacities too, also climbing up on the companies' hierarchical ladder. New added functions were according to Feeny and Willcocks [7]: Strategic technology planning and control, IT architecture management, IT standards development, and Human resource management. Aimed to accomplish functions mentioned, needed IS capabilities were:

1. Integration ICT into business activities,
2. Business systems thinking – defining business processes enabled by technology ,
3. Relationship building – working with business managers to improve IT usage,
4. Architecture planning – creating a blueprint for a technical platform that will be responsive to current and future business plans,
5. Making technology work – achieving timely technical progress,
6. Informed buying – managing the IS purchasing or outsourcing strategy to meet the needs efficiently,
7. Contract facilitation and monitoring – managing contracts for IS services and watching the business's contracts and
8. Vendor development – identifying and assessing the added value of IS service providers.

This third wave demonstrates already high level of CIO profession maturity. Natural consequence is some kind of standardizing the role and required skills of modern CIOs. This activity is in the focus of some well-known international institutions, as CEPIS (Council of European Professional Informatics Societies) [3] and IRMA (Information Resource Management Association) [10].

As a part of CEPIS activity there are two programs: EUCIP (European Certification of Informatics Professionals) [3] and SFIA (Skills Framework for the Information Age) [14]. The EUCIP model defines 22 IT occupations, including the "IS manager". This notion, in contrast to CIO, makes bias on technology (compared to business), which is demonstrated by task groups presented in the Table 1: .

Recent sources as Broadbent and Kitzis [2] from Gartner suggest very neat functional breakdown

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of CIO capacities, based exactly on the trend in CIO evolution: from technology to business. It focuses on following two sides of IT/IS function role in the company:

- "Demand side": this is mainly the relation of IT/IS department to its "customers", i.e. business units in the company. Their representative is the company management. This side of IT/IS operations gives the answer to the question "What?": "What is IT/IS department doing?". Answer is in brief: supporting the business, enabling its functioning, preferably bringing competitive advantage to the company. Thus, "demand side" deals with the notion "effectiveness".

- "Supply side": these are internal functions of an IT/IS department or its "back office". Typically, this side of IT/IS operations deals with technology and expenditures for it, as well as internal organization and HR issues. Supply side can be described with the question: "How?": "How the IT/IS department is operating internally?". Thus, "supply side" deals with the notion "efficiency".

So we found most appropriate to map the task groups list taken from CEPIS [3] and with demand/supply sides breakdown, as shown in the Table 1:

Table 1: CEPIS task groups list mapped with demand/supply sides breakdown

Demand side operation
▪ IS and business environment
▪ Managing business change
▪ Business activity & Business process modeling
▪ Accounting & financial management
▪ Project management essentials
▪ Managing business risks & IT security
▪ Managing data protection
▪ Business intelligence & data warehousing

▪ New technology opportunities
▪ Managing enterprise applications integration
Supply side operation
▪ IS management
▪ IT organizational structure & measuring business benefits
▪ Service management essentials
▪ System deployment methods
▪ Organizational strategy & IT system selection
▪ Defining a solution architecture
▪ Principles of testing
▪ Network essentials
▪ World Wide Web
▪ IT service delivery
▪ Procurement

SFIA provides a common reference model for the identification the skills needed to develop IS making use of ICT. It is a logical two-dimensional framework consisting of areas of work on one ax and levels of responsibility on the other. There are 5 main areas of work and 7 levels of responsibilities: 1. Follow, 2. Assist, 3. Apply, 4. Enable, 5. Ensure/advise, 6. Initiate, and 7. Set strategy/inspire/mobilize.

Information management belongs to SFIA area Strategy & planning and 7th level of responsibility. Requirements for information management are shown in Table 2:

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among colleague CxOs. First step in mastering important skills is their list, broke down in categories and subcategories, as defined by SFIA reference model, Version 4 (Table 3:).

Table 2: Requirements for CIOs derived from SFIA model [14]

Autonomy	Has authority and responsibility for all aspects of a significant area of work, including policy formation and application. Is fully accountable for actions taken and decisions made, both by self and subordinates.
Influence	Makes decisions critical to organizational success. Influences developments within the IT industry at the highest levels. Advances the knowledge and/or exploitation of IT within one or more organizations. Develops long-term strategic relationships with customers and industry leaders.
Complexity	Leads on the formulation and application of strategy. Applies the highest level of management and leadership skills. Has a deep understanding of the IT industry and the implications of emerging technologies for the wider business environment.
Business skills	Has a full range of strategic management and leadership skills. Understands, explains and presents complex technical ideas to both technical and non-technical audiences at all levels up to the highest in a persuasive and convincing manner. Has a broad and deep IT knowledge coupled with equivalent knowledge of the activities of those businesses and other organizations that use and exploit IT. Communicates the potential impact of emerging technologies on organizations and individuals and analyses the risks of using or not using such technologies. Assesses the impact of legislation, and actively promotes compliance. Takes the initiative to keep both own and subordinates' skills up to date and to maintain an awareness of developments in IT in own area(s) of expertise.

Of course, going down on SFIA levels scheme, personal responsibility for CIOs is gradually diminishing. Lower levels might be certain problem for CIOs with non-IT background: they have to understand at least technology "big picture", aimed to gain credibility perception

Table 3: Breakdown of SFIA skills for CIOs (level 7), adopted from [14]

Category	Subcategory	Skill
Strategy & architecture	Information strategy	Corporate governance of IT
		Information management
		Information systems coordination
		Information assurance
	Advice and guidance	Consultancy
		Technical specialism
	Business/IT strategy and planning	Business process improvement
		Enterprise architecture
	Technical strategy and planning	Software development process improvement
Business change	Business change implementation	Portfolio management
		Program management
		Project management
Solution development and implementation	Systems development	Systems development management
	Human factors	Human factors integration
Service management	Service strategy	IT management
	Service design	Service level management
Procurement & management support	Supply management	Supplier relationship management
	Quality management	Quality management
		Technology audit

In this preliminary study only level 7 was taken into consideration. Of course, the skills from some of lower levels in SFIA reference model should also be taken into consideration in future detailed researches. This is based upon common sense practice, that depending on several factors, CIO should also be able and demonstrate abilities and knowledge of every-day IT/IS operation. It can also be very useful in personal marketing in all directions (360°: to CEO, peer and business colleagues, reporting department heads and "blue collars"). In that situation CIO should be aware of time-management controversy: as leadership guru Paul Bridle

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describes in [1] three levels of activities – leadership, management and process are to be balanced carefully in CIO's everyday routine.

In the literature we found and IRMA CIO model too. The primary objective of IRMA is to assist organizations and professionals in enhancing the overall knowledge and understanding of effective information resources management in the early 21st century and beyond. Among other things, the IRMA is also active in defining the professional development of people in the U.S. public administration. With ICT relating functions there are 7 occupations [10], one of them is also CIO. The CIO Certificate Program is organized around 12 subject areas directly related to CIO competencies identified by the Federal CIO Council:

- Policy,
- Strategic Planning,
- Performance & Results Based Management,
- Capital Planning and Investments,
- Project Management,
- Technology Assessment,
- ICT Architecture and Infrastructure,
- Security and Information Assurance,
- E-Government / E-Business,
- Leadership and
- Acquisition.

Each of these subject areas contains multiple courses students can select to tailor their CIO program of study to meet their personal background, organization's needs and priorities [10].

Analysis of observed model, we have concluded that the third wave of CIO issued a series of new roles and made more complex demands on this function.

2.4 The fourth wave

During the past 10 years, besides *usually roles*, CIO has evolved into one responsible for providing the IT infrastructure and capabilities to ensure effective business operations and CIOs role has become more strategic in nature initiating business to change processes through the use of IT. Delivering value, relationship building, security, performance measurement and governance had become new CIOs responsibilities. Thus we come to the need for the identification of today's CIO responsibilities. Although it retains the previous abbreviation, under it all starts to induce more new roles – Chief Innovation Officer. It is the beginning of the forth wave. New CIOs capabilities are *particularly:*

- Cross-functional integration,
- Inter-organisational integration and
- Visioning & information innovations.

The requirements of modern ICT-leader can be also described in relation to his/her functional position in the company, as described by Broadbent and Kitzis [2], as mentioned with "demand" and "supply" side of IT/IS department operation. These "poles" of requirement groups can be furthermore presented in breakdown in Table 4:

Table 4: Eight skills/knowledge areas in demand and supply sides adapted as presented in [2]

Demand side (What?)	Supply side (How?)
business strategy	organization,
business processes	sourcing
marketing	governance (IT/IS processes and applied tools)
aligning	technology

Seeing the questions "What?" and "How?" for describing demand and supply side of IT/IS department operations, we can derive the main focus of these two aspects: demand side deals with effectiveness and supply side with efficiency of an IT/IS department. In communication its mission/vision to the business, CIO demonstrates in "doing good things" (effectiveness, demand) and in "doing things good" (efficiency, supply). For sides, CIO and his/her crew must have profound knowledge, unlike to some other CxOs, who can act almost

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"artistic" (e.g. marketing) or by grabbing instantaneous opportunities (e.g. CFO).

2.5 CIO characteristics today

The current body of literature suggests that has little information about today's CIO roles and responsibilities. However, some sources still exist [4]. So, Linda Fleit has provided an excellent summary of what is needed for CIO position, requirements presented here and adapted from [8] are:

1. the person should have a vision about the role of ICT in firm and some clear ideas about where it can make the greatest contributions to business,
2. technological skills and understanding,
3. excellent oral and written communications skills, including listening as well and ability to communicate well with and at all levels of the firm,
4. the ability to form alliance and good relationships with key users to make sure that all ICT efforts are in line with the firm's goals,
5. the ability to work collaboratively and effectively, both with one's staff and with one's peers,
6. the ability to make and stick to hard decisions that are the firm's best interests, combined with the agility to stay flexible and open at all times,
7. the ability to manage resources in an environment where the demand is greater than the supply,
8. management experience,
9. deep expertise in at least one aspect of ICT itself, and
10. boundary – spanning ability.

Behaviour requirements for modern CIOs defined also in EUCIPs model. According this source the CIO / IS Manager role requires initiative, flexibility and a rational mental attitude capable of conceptual and analytical thinking, even under stressful conditions: a persistent goal-oriented approach in a strategic perspective has to be combined with strong attention to details. Another essential set of skills is the ability to communicate and interact effectively (in both oral and written form) with colleagues, users and managers: this should include a high organisational awareness, leadership in information acquisition, as much as the ability to plan, organise, make decisions, provide direction and follow-up. Furthermore, the CIO / IS Manager should be able to build and maintain a good relationships with supplier of the wide variety of products he typically buys, namely consulting services, application software, hardware, network and telecommunication services. For supplier can be partner also in innovation. Finally he/she is able to assess, compare and select different technologies and product in respect to business need.

We can see that the most of these requirements involve managerial and leadership skills, not only technical skills. The need for technical expertise is far less prominent than it was just a few years ago. Increasingly, the CIO must assume a more generalized role, acting as facilitator, coach and partner.

3. Research approach and results

3.1 Mapping the existing models and generating framework for CIO BOK

On the basis of literature analysis and based on our own many years of CIO practice, we have concluded that there are very different approaches toward defining the roles, responsibilities and capabilities (summarized as "capacity" in one word) of modern CIOs, why still not exist a unique BoK (Body of knowledge). Our intention to map the Feeny & Willcock's approach [7] and de-facto standards in this area (IRMA, EUCIP, SFIA) landed in very complex and thus not practical cross-reference. Thus we decided to go other way: to try to map these qualification lists with nevertheless simpler eight demand/supply areas as suggested by Broadbent and Kitzis [2].

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Table 5: Four CIO skill schemes mapped with DEMAND areas

CIO's areas of roles	Feeny& Willcock CIO	IRMA CIO	EUCIP-CIO	SFIA Skill	Demand side groups
E-Government & E-Business		x			1. business strategy
Policy / Business System Thinking and IS	x	x	x		1. business strategy
Portfolio management				x	1. business strategy
Strategy planning		x			1. business strategy
Business activity & Business process modeling		x	x	x	2. business processes
Enterprise architecture				x	2. business processes
Information management, Business intelligence & data warehousing			x	x	2. business processes
Managing enterprise applications integration			x		2. business processes
New technology opportunities & business change			x		2. business processes
Human factors integration				x	3. marketing
Leadership	x	x			3. marketing
Relationship Building and consultancy	X			x	3. marketing
Accounting, financial management capital planning/investments		x	x		4. aligning
Acquisition		x			4. aligning
ICT security		x	x	x	4. aligning
IT organizational structure & measuring business			x		4. aligning

Four CIO skill schemes mapped with SUPPLY areas

CIO's areas of roles	Feeny& Willcock CIO	IRMA CIO	EUCIP-CIO	SFIA Skill	Supply side groups
benefits					
Managing data protection			x		4. aligning
Organizational strategy & IT system selection			X		5. organization
Program/project management	x	x	X	x	5. organization
Contract Facilitation & Monitoring	x				6. sourcing
IT service delivery			X		6. sourcing
Informed procurement & SLA	x		X	x	6. sourcing
Supplier & vendor relationship management	x			x	6. sourcing
Corporate governance of IT				x	7. governance
IT & Information systems coordination			X	x	7. governance
Making Technology Work	x				7. governance
Quality, Performance & Results based management		x		x	7. governance
Software development/deployment process improvement			X	x	7. governance
Defining a solution architecture			X		8. technology
ICT architecture planning & infrastructure	x	x			8. technology
Network & WWW essentials			X		8. technology
Principles of testing			X		8. technology
Technical specialism				x	8. technology
Technology assessment & audit		x		x	8. technology

In Table 5: and 0 we have listed 34 CIO's areas of roles (17 in each of demand and supply areas) summarized from 56 roles specified in four different skill schemes (Feeny & Willcock, IRMA CIO, EUCIP-CIO and SFIA level 7). Demand and supply areas are further broke-down in eight areas as presented in Table 7.

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3.2 Data collections about CIO population in Croatia

Aimed to define CIO population in Croatia we used several sources. According to it, Croatia has more than 80,000 active economic subjects, with the following structure:

- Major businesses: 1%
- Medium businesses: 4%
- Small businesses: 95%

We presume thus that some 800 companies have genuine and complete ICT function with CIO heading it, which should be completed with some 200 state-owned institutions. In 3,200 businesses ICT function is not a separate organizational unit with only handful of employees, while in the majority of rest there are no employees exclusively dedicated to ICT function (they rely mostly on external or even unprofessional services).

Based on these facts we have chosen some 200 CIOs and invited them per e-mail to complete the survey posted on http://www.freesurveysonline.com/ . There were 3 question groups asked:

1. Facts about company and its ICT function
2. Personal demography
3. CIO roles, responsibilities and skills

3.3 Survey results

In total 40 CIOs and other executives answered the survey. They cover uniformly complete range of business activity in Croatia: manufacturing, ICT, public sector, trade and other services. Average yearly revenue of the company is about 4,13 bn kn, with 3.190 employees, while average number of employed in ICT is 66 or 2,06%. Yearly overall average ICT budget (investments and costs, including salaries) is 37 mn kn, making some 0,91% of total revenue. Latest figure shows substantially lower expenditure level compared to Gartner's figures for 2007, with 4.1% of ICT total

expenditures [9]. It should be considered positively to know that more than half of respondents are either management board members or report directly to CEO. Most important ICT area is considered "operations", followed by development and least important sourcing of external services.

Personal demography of respondents shows that CIO is predominantly "big boys" matter: 35 out of 40 respondents are men, none under 30, 2/3 over 40. Educational background is surprisingly high for different technical faculties (almost 85%) as well as for B.SC. and Ph.D. degrees (almost 50%). Professional background for CIO (previous position) was in 50% cases head of IT department.

When asked about 14 different roles and responsibilities (multiple choice answer), respondents answer firmly in favour of following four: ICT governance, systematic approach to business, ICT operations and ICT value delivery, followed closely with leadership and ICT architecture design.

In the survey we asked for importance comparison between demand and supply side of ICT function: respondents were clearly in favour of demand side (87%), which brings evidence that Croatian CIOs are very well aware of predominant importance of business - vs. technology-thinking. This disclaims usual stereotype that CIOs with technical background (in our survey 85%) neglect business agenda. Further breakdown of demand/supply sides as shown in Table 4: the respondents find innovations, business strategy contribution and systematic approach to processes as most important (80, 74, 53% respectively), while communication, marketing and cost control are considered as less important. This is consistent with general trend of getting more and more importance on innovation for IT/IS leaders [12].

Our survey shows, that the CIOs in Croatia have practically uniform distribution on every of three groups of activities (leadership, management and process): 29.3%, 37.2% and 32.9% respectively. This information should be used to be aware of

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wasting precious CIO time aimed to raise management and especially leadership portion.

Finally we asked about the skills CIOs feel to lack. Interestingly, majority (64%) considers marketing as competence which has to be improved, followed by sourcing (23%). On the other side, CIOs claim to have enough qualifications in organization skills as well as in business processes understanding.

5. Conclusions and recommendations

Analysis of the history of ICT function leaders, shows the dramatic drift from EDP phase and technology orientation to genuine ICT leader, important business function climbing on the highest hierarchical level in company management. According this the CIO roles and responsibilities were changed. In this moment there is no unique CIO BOK. Numerous sources describe relative different skills, qualifications and competencies that are mandatory for CIO function today. Linking to the needed qualifications, analyzing scientific papers and models: IRMA, EUCIP and SFIA, de facto standards for the competition development, it is possible to generate original CIO BoK structure. This breakdown is based on demand/supply side of ICT services, with further breakdown of each area.

Survey conducted shows that our CIOs are aware of importance of demand side compared to supply (technology side). Recommendations are clear: demonstrate ICT value by business-thinking, adopt qualification standards, improve time management with greater impact on leadership and acquire new skills such as marketing and sourcing methods.

- Historically we witness dramatic changes in the roles and responsibilities of IT/IS leaders: from pure technology towards business processes and strategy
- These changes reflect also on the position of IT/IS leaders in the company hierarchy: from department head to management board member or CIO
- The changes mentioned have also substantial impact on qualifications requested: we have the drift from technology related skills to business skills (hard and soft)
- CIO qualifications are on their way to be standardized, where EUCIP, SFIA and IRMA standards are to be taken into consideration for building CIO BoK, as well as major papers mentioned in the article.
- CIO BoK models mentioned differ strongly, as demonstrated in the article. We suggest mapping them with very modern approach of demand/supply side of IT/IS operation.
- Survey conducted showed most important result in area that Croatian CIOs consider demand side substantially more important compared to supply (technology) side.
- This conclusion is even more important having in mid that waste majority of CIOs have technological educational background.
- Finally, CIOs claim that they lack marketing skills, as well as knowledge of sourcing activities.

Our recommendations are:

1. CIOs and other executives are to be aware of importance of *business-thinking* compared to pure technology skills of a CIO
2. CIO has to broaden his/her knowledge and be up-to-date with his skills in all areas defined by de facto standards: *IRMA, SFIA, EUCIP* described in this article
3. We suggest that CIOs check their knowledge against demand/supply scheme presented in Table 4: against process/management/leadership *working time* distribution, aimed to increase the portion of higher executive's value for the company
4. As evidenced by the survey, CIOs have to improve their knowledge in areas of *marketing and sourcing*
5. Our ICT oriented faculties should follow these trends in changing CIOs roles and responsibilities and quickly adapt their curricula.

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6. This subject is not represented in existing research in Croatia, which should initiate and implement *further research* efforts aiming to get more detailed information on broader pattern and produce more specific recommendations for both CIO background areas (technology and business)

7.   Acknowledgements

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