

ИНФОРМАЦИОННЫЙ МЕНЕДЖМЕНТ

УДК 330.4

V. Nissen, F. Termer, M. Petsch, T. Müllerleile, M. Koch

CHIEF INFORMATION OFFICERS IN THE PRIVATE AND PUBLIC SECTOR OF GERMANY — HOW SIMILAR ARE THEY?

The similarities and differences of Chief Information Officers (CIOs) in the private and public sector is currently an under-researched field, even though it is clear that different organizational objectives and regulatory frameworks will leave their imprint on the tasks and focus of top IT managers. By way of an online survey we investigate the situation of CIOs within the public and private sector of Germany. In the questionnaire, the focus was on four specific aspects of content: denomination, characteristics, tasks and organizational integration of the respective CIO. In order to characterize the function of a CIO, the exploratory factor analysis (EFA) offers a dimension reducing process. To be able to examine what

Volker NISSEN — Prof. Dr. Volker Nissen, Head of Department of Business and Information Systems Engineering in Services, Ilmenau University of Technology, PO Box 10 05 65, D-98684, Ilmenau, Germany; volker.nissen@tu-ilmenau.de

Frank TERMER — Dr. Frank Termer, PostDoc, Department of Business and Information Systems Engineering in Services, Ilmenau University of Technology, PO Box 10 05 65, D-98684, Ilmenau, Germany; frank.termer@gmx.net

Mathias PETSCH — Dr. Mathias Petsch, PostDoc, Department of Business and Information Systems Engineering in Services, Ilmenau University of Technology, PO Box 10 05 65, D-98684, Ilmenau, Germany; mathias.petsch@tu-ilmenau.de

Thomas MÜLLERLEILE — PhD Candidate, Department of Business and Information Systems Engineering in Services, Ilmenau University of Technology, PO Box 10 05 65, D-98684, Ilmenau, Germany; thomas.muellerleile@tu-ilmenau.de

Matthias KOCH — Master Student, Department of Business and Information Systems Engineering in Services, Ilmenau University of Technology, PO Box 10 05 65, D-98684, Ilmenau, Germany; matthias.koch@tu-ilmenau.de

Волкер НИССЕН — кандидат экономических наук, профессор, заведующий кафедрой экономики и информационных систем в сфере услуг, Университет Технологий Ильменау, PO Box 10 05 65, D-98684, Ильменау, Германия; volker.nissen@tu-ilmenau.de

Франк ТЕРМЕР — кандидат экономических наук, научный сотрудник, кафедра экономики и информационных систем в сфере услуг, Университет Технологий Ильменау; PO Box 10 05 65, D-98684, Ильменау, Германия; frank.termer@gmx.net

Матиас ПЕТШ — кандидат экономических наук, научный сотрудник, кафедра экономики и информационных систем в сфере услуг, Университет Технологий Ильменау, PO Box 10 05 65, D-98684 Ильменау, Германия; mathias.petsch@tu-ilmenau.de

Томас МЮЛЛЕРЛАЙЛЕ — аспирант, кафедра экономики и информационных систем в сфере услуг, Университет Технологий Ильменау, PO Box 10 05 65, D-98684 Ильменау, Германия; thomas.muellerleile@tu-ilmenau.de

Маттиас КОХ — магистрант, кафедра экономики и информационных систем в сфере услуг, Университет Технологий Ильменау; PO Box 10 05 65, D-98684, Ильменау, Германия; matthias.koch@tu-ilmenau.de

tasks a CIO typically perceives in the private sector (PRIV) versus public administration (PA) a cluster analysis is performed on the basis of factor scores. Three clusters were identified for the PA cohort while four different clusters could be found in the PRIV cohort. In order to identify characteristics of the CIO better with reference to the predominant tasks, characteristic personality profiles were assigned to each task cluster.

The function of a CIO is well established in the German private sector, although the role of IT has been changing in organizations lately. What in the private sector represents a largely closed process is available in public administration only as the beginning of a trend. The Office of the Federal Government Commissioner for Information Technology, which corresponds to a CIO for Germany, was created only in 2007 and in some of the sixteen German states no similar role has been established to this day. Moreover, also the tasks of the CIO in public administration vary markedly.

Comparing the results of the cluster analysis of the PRIV and PA cohorts, it becomes clear that the task profiles of CIOs in these sectors often differ significantly. Thus, although the group “Hands-on manager” for the PA and “Administrator” in the PRIV cohort, as well as “IT architect with operational tasks” in the PA and “IT architect” in the PRIV cohort show some similarities, the other profiles are not to be found in the respective other sector. The profile of the “IT representative” is available only in the area of public administration and the profiles “IT generalist” and “IT service manager” are to be found only in the private sector. The characteristics of each group of IT-managers and related findings are identified and explained in this paper. Refs 22. Figs 4. Tables 4.

Keyword: CIO, Government, Public administration, empirical study, IT tasks.

В. Ниссен, Ф. Термер, М. Петш, Т. Мюллерлайле, М. Кох

ДИРЕКТОР ПО ИНФОРМАЦИОННЫМ ТЕХНОЛОГИЯМ В ЧАСТНОМ И ОБЩЕСТВЕННОМ СЕКТОРЕ ГЕРМАНИИ — ЕСТЬ ЛИ РАЗЛИЧИЯ?

Сходства и различия в должностях главного директора по информационным технологиям (ИТ) в частном и общественном секторе в настоящее время недостаточно тщательно изучены, хотя очевидно, что различные организационные задачи и правовое регулирование отражаются на целях и задачах менеджеров. В данном обзоре мы рассматриваем полномочия директоров по ИТ в частном и государственном секторах Германии. В составленной анкете основное внимание уделялось четырем аспектам: категория, описание, задачи и организационная интеграция соответствующих менеджеров. Для описания функций менеджеров был использован метод факторной оценки, основанный на процессе упрощения. Чтобы рассмотреть, какие задачи директор по ИТ выполняет в частном секторе в отличие от общественного, использовался метод кластерного анализа на основе оценки факторов. Для общественного сектора было выделено три группы и для частного сектора — четыре. В целях определения характеристик, необходимых для выполнения основных задач, для каждой группы был составлен определенный профиль личностных качеств.

Роль директора по ИТ в немецком частном секторе достаточно четко определена, хотя и подверглась некоторым изменениям в последнее время. Процесс, который в частном секторе уже почти завершился, еще только начинается в общественном. Пост федерального государственного комиссара по ИТ, или директора по ИТ на территории Германии, был создан только в 2007 г., а в некоторых из 16 федеральных земель Германии данной должности не существует до сих пор. Более того, задачи и полномочия каждого отдельного руководителя ИТ в общественном секторе значительно разнятся.

Сравнив результаты кластерного анализа различных групп руководителей частного и государственного сектора, становится очевидно, что портфолио задач руководителей данных секторов также значительно различается. Так, например, хотя группы «оперативных менеджеров» в общественном секторе и «администраторов» в частном секторе, а также «ИТ архитекторов с операционными задачами» в общественном секторе и «ИТ архитекторов» в частном демонстрируют некоторое сходство, другие выделенные группы не имеют точек пересечения. Группа «ИТ представитель» выделяется только в секторе общественного управления, а группы «ИТ менеджер широкого профиля» и «ИТ менеджер в сфере услуг» существуют только в частном секторе. В приведенной статье описываются характеристики каждой выделенной группы ИТ менеджеров и приводятся соответствующие выводы. Библиогр. 22. Ил. 4. Табл. 4.

Ключевые слова: ИТ-директор, правительство, общественное управление, эмпирическое исследование, задачи ИТ.

1. Introduction and Motivation

In the year 2000 the (then) biggest European eGovernment initiative (BUNDOOnline 2005) was started in Germany. With eGovernment initiatives across Europe for years now, it becomes evident that the operation and security of IT in the public sector is a grand challenge [Goetze and Schoop, 2006]. With different regulatory frameworks and organizational objectives guiding the working of IT departments the question arises what the similarities and differences of CIOs are in the private and public sector. However, a literature review revealed that this theme is quite neglected in the scientific literature today. Therefore, we decided to address this issue in the form of an online survey of top IT managers and investigate the situation in Germany.

The term Chief Information Officer (CIO) is only imprecisely described in literature [Krcmar, 2010, p. 386] due to the fact that his area of responsibility is not clearly defined and depends highly on the position of the individual person in the organizational structure of the respective company and the resulting competences [Schwertsik et al., 2011, p. 18]. Laudon et al. [2010, p. 866] define the CIO as the head of the IT department being part of the top management, who plans and controls the use of IT in the company. KRCMAR [2010, p. 390] similarly describes the CIO as part of the managerial staff who is responsible for the information technology and its application. However, in the USA the CIO is mainly responsible for information management tasks [Krcmar, 2010, p. 386].

From a historical point of view, the position of the CIO has changed fundamentally in the last years: In the past being “only rarely part of the managing board or the top management” [Holtzschke et al., 2009, p. 2, translated], the CIO has meanwhile promoted to the top level management [Baur Schmid, 2010, p. 159]. In relation to the different interpretations of the term CIO, the associated tasks vary accordingly.

On the basis of expert interviews with responsible IT persons, Daum et al. [2004] have identified the most important tasks to carry out for a CIO and classified them in technical and economic as well as strategic, administrative and operational tasks (Table 1). In the course of this work they form the basis for the evaluation of the CIO tasks in the public and private sector.

In this context it is questionable, whether the tasks and the position of a CIO in the public administration is described similarly, or rather which differences exist in comparison to the private sector. It may be assumed that due to the federal structures in the public administration — especially the responsibility structures by regions and the territorial sovereignty [Mehlich, 2002, p. 41] — other demands are placed on a CIO in the public administration than in the private sector.

A study dealing with IT governance by strategic coordination in municipalities [Goetze and Schoop, 2006, p. 59] showed that alike in the private sector the probability that an IT strategy exists increases with the size of a municipality. In addition it was uncovered that in 43% of the cases no IT strategy existed at all. As a consequence IT strategies are often not aligned with strategies of the respective municipality and, therefore, no strategies for an integrated eGovernment are available at this level. Furthermore in 53% of the cases the municipal management was not involved in drawing up the IT strategy. Despite the fact that this study dates from 2006 and mainly municipalities and not state or federal ministries were looked at, this survey suggests the conclusion that the range of responsibilities of a CIO in public administration may be too much focused on operative tasks.

Table 1. Classification of CIO tasks

	Strategic Tasks	Administrative Tasks	Operational Tasks
Technical Tasks	Strategic planning of information systems (IS) IS-architecture planning Knowledge management	Implementation and integration of IS Further development of IS IS-architecture building Application development planning	Maintenance of IS Development and service control Network management
Economic Tasks	Development of IT strategy Highlighting of business possibilities of IT Business value of IT Support of executive board with regard to IT questions Business Process Reengineering	Project management Cost allocation Reduction of IT costs Increase of IT and data security IT controlling Evolution of IT staff IT market analyses	

Sources: [Daum et al., 2004].

Up to now, the development of strategies for public administration and for the associated IT-department are hardly examined mutually. Therefore, we currently also lack a clear cut picture of CIO-tasks in public administration. However, we could not find any proofs in literature that demonstrate that the job of a CIO in the private sector differs from one in public administration. Consequently, in this article, we examine by way of an empirical study whether there are differences in the existing scopes of tasks, or rather how the main focuses concerning the shaping of the CIO role are reflected.

In the following, the design and the evaluation of this empirical study is highlighted, before presenting our conclusions and some avenues for further research.

2. Design of the Study and Data Collection

On the basis of a survey among top IT managers, in the present work at first the range of responsibilities of CIOs is identified and then summarized with the help of an exploratory factor analysis. Thereafter, the persons with their ranges of responsibilities in public administration or rather in the private sector are allocated to groups with certain common characteristics by means of a cluster analysis. Herewith it becomes possible to categorize the groups identified with view to their organizational position and their strategic, administrative or technical shaping.

To be in the position to compare CIOs in public administration with CIOs in the private sector, samples for the public administration were procured at CIOs and IT decision makers of the Federal Government and the States of the Federal Republic of Germany as well as at the accompanying departments, or rather ministries. This choice was made due to the fact that as a rule no CIOs exist on the municipal level. The CIOs of the States were, if possible, contacted directly, with the exception of the States Baden-Wuerttemberg, Hesse and Thuringia, which at the point of time of this survey did not have this position.

On the basis of the number of data records gathered in public administration (PA cohort) a roughly equally large number was collected in the private sector (PRIV cohort) to make a comparison of the groups possible. For this we used an already existing list of contacts of IT decision makers and we tried to win support as well on the online platform "Xing" in relevant CIO groups. Altogether we sent 275 invitations to CIOs and IT decision

makers of whom 114 persons sent the questionnaire back. But only 84 questionnaires were answered completely and could therefore be considered in this study.

Concerning the content, the questionnaire especially focused on four aspects: denomination, characteristics, tasks and organizational integration of the CIO in question. Due to the lack of scientific literature and empirical studies dealing with CIOs in public administration in Germany, or rather their partly different alignment, it was necessary to collect empirical data about the questions of interest. The basis for this data collection is the sampling procedure Quota, or rather a deliberately made choice using the concentration procedure (cut-off procedure) [Hofte-Fankhauser and Wälty, 2012, p. 35–36]. The business function of the questioned persons as well as the branch of industry served as quota features.

Due to the limited availability of scientific literature concerning CIOs in public administration, the questionnaire was created mainly on the basis of literature dealing with CIOs in the private sector. To balance possible differences in the scope of tasks between CIOs in both spheres, we paid attention to also offer answering options that would fit the public sector. Moreover, the questioned person had the opportunity to write an individual answer in the form of a text. Information on the designation, the characteristics and the tasks of CIOs were collected by means of direct queries, whereas for the determination of the organizational position several questions had to be derived.

The characteristics asked for base on the characteristics of CIOs according to Laudon et al. [2010, p. 870] and are classified into those of “old” and of “new” IT managers (Table 2).

Table 2. Desired characteristics of a CIO

IT manager „old“	IT manager „new“
oriented to technology	oriented to (business) processes
IT has an own significance	IT is a means to an end
qualified in technology	qualified in leadership
specialist	generalist
cost-oriented	results-oriented
oriented internally	oriented externally (business units)
follows technical innovations	stimulates business innovations
knows about technology	knows about technology and business
thinks in project cycles	thought processes are oriented to competition

Sources: [Laudon et al., 2010, p. 870].

For this question the opposite characteristics were shown as opposite poles (semantic differential) and rated with the help of a five-step scale. For the CIO tasks, we used a subdivision into technical, economic, strategic, administrative and operational tasks according to Daum et al. [2004] and asked the IT top managers to rate the relevance of these tasks for their work also on a five-step scale.

Besides the questions concerning the aspects in focus of this study, further questions for a general comparison between CIOs in public administration and the private sector were included. These refer to the person itself and the enterprise or organization of the participant. The survey was carried out online using software from QuestBack. The data were collected between 13th September and 19th October 2013.

3. Empirical Analysis

a. Factor Analysis

To characterize the sphere of tasks of CIOs in the private sector and in public administration, the Exploratory Factor Analysis (EFA) suggests itself as a dimension reducing procedure. Herewith latent factors can be identified which convey the characteristics of the CIO position accordingly.

Before carrying out the EFA, the data record was adjusted by a complete case analysis and examined with view to its general suitability for this analysis. Central criteria providing insight into whether a data record is in principle suitable for the EFA are the KMO criterion, the Bartlett test [Bartlett, 1951] and the subject-to-item relation. Here, a KMO value of more than 0.5 suggests that the data principally have a certain correlation and can therefore be used for an EFA [Kaiser and Rice, 1974, p. 112]. In this case the KMO value was 0.68 and therefore it can be assumed that the data are suitable for an EFA from this perspective.

The Bartlett test on his part suggests a general suitability of the data for an EFA in case of a rejection of the null hypothesis. For the data in question the result is significantly ($p < 2.2e-16$) different from zero. The null hypothesis — which means that the correlation matrix is coincidentally different from the unit matrix — can as a conclusion be rejected and, herewith, the Bartlett test also confirms the suitability of the data for an EFA. In addition the subject-to-item relation was determined, providing insight into whether the data record has the necessary size for an EFA. With a relation of 5.6:1 the size corresponds with recommendations given in literature [Costello and Osborne, 2005, p. 4].

To determine the number of extracting factors, the Acceleration Factor suggested by RAÏCHE ET AL. [2013, p. 24] was used. Generally this leads to better results [Ruscio and Roche, 2012] than for example the K1 criterion [Kaiser, 1960, p. 145] or the Scree-Test [Cattell, 1966, p. 245]. In the present case, three factors could be determined numerically by means of the Acceleration Factor. As a factor extraction method „minres“ [Harman and Jones, 1966, p. 363] was used. As a way of rotation “oblimin” was chosen according to Costello and Osborne [2005].

In Table 3 one can see that the items can be assigned to the individual factors selectively, as with a cut off of 0.4 every item — with one exception — only loads on one factor. At the same time most of the items have factor loadings of >0.6 . In the aggregate, the three-factor solution explains a cumulated variance of 0.46.

In factor MR1 three task groups are summarized: At first the tasks *IS architecture building* and *IS architecture planning*, furthermore *development of IS* as well as *planning of the application development* are assigned and finally also *strategic planning* is seen in this factor. As a result, here those tasks are gathered which we with recourse to Table 1 call “strategic-technical”.

In factor MR2 the tasks *maintenance of IS*, *network management*, *development and service control*, *IT and data security* topics as well as *project management* are summarized. As these tasks rather orientate to the daily business and the strategic planning therefore even loads with a negative weight on this factor, the factor MR2 can be seen as an opposite group of tasks to factor MR1, which we therefore call “operational”.

In factor MR3 the tasks (*internal*) *consultancy*, *business process reengineering*, increase of *IT business value*, *development of an IT strategy* and the demonstration of *business opportunities* are summarized. As these tasks belong to a long-term time horizon and rather

to the more professional scope of duties of a CIO, we call this factor “strategic-economic”. Contrary to MR1 and MR2 this factor corresponds exactly with the description of this group of tasks in Table 1.

Table 3. Results of the factor analysis for CIO tasks

Task	MR1	MR2	MR3
A_IS_architecture_building	0.946		
A_IS_architecture_planning	0.781		
A_development_IS	0.534		
A_maintenance_IS		0.709	
A_network_management		0.699	
A_development_service_control		0.550	
A_project_management		0.515	
A_consultancy			0.703
A_BP_reengineering			0.617
A_business_value_IT			0.615
A_development_IT_strategy			0.591
A_business_value_opportunities			0.530
A_planning_application_development	0.484		
A_strategic_planning	0.469	-0.464	
A_IT_and_data security		0.439	

It is obvious that the administrative scope of tasks does not emerge from the EFA but is spread over the strategic and operational tasks. The former administrative-technical tasks go to the factor MR1 “strategic-technical” and the former economic-administrative tasks are assigned to the factor MR2 “operational”.

The persons questioned could not clearly assign the tasks *knowledge management, implementation and integration of IS, cost allocation, reduction of IT costs, IT controlling, evolution of IT staff* and *IT market analyses* to operational or strategic scopes of tasks. As these did not form an own “administrative” task either, they are no longer looked at in the further cluster analysis.

To be in the position to examine which tasks a CIO typically has in the public or rather private sector, on the basis of factor values a cluster analysis is carried out in the following.

b. Cluster Analysis

In practical application, a multistage procedure for cluster analysis has become established. With the aid of a single linkage procedure, outliers are removed from the data record first. Then the cluster assignment is carried out by means of a Ward procedure and finally it is refined with the help of k-means procedures [Homburg and Krohmer, 2009, p. 366; Schlittgen, 2009, p. 426].

Next to the linkage procedures, especially the Ward procedure is widely spread in practice [Backhaus et al., 2011, p.426]. Starting out from the trivial solution that every individual case forms an own group, the further forming of groups is not carried out on the basis of distance measures, but those objects are united that least of all enlarge a specified

heterogeneity measure (sum of squared errors) [Backhaus et al., 2011, p. 426; Fantapié-Altobelli, 2011, p. 256–257; Schlittgen, 2009, p. 401]. As a result we have as homogenous as possible clusters, which in addition have almost the same size.

A cluster assignment on the basis of the application of the Ward procedure is possible under the condition that all variables are measured on a metric scale level and that the variables are uncorrelated [Backhaus et al., 2011, p. 430–431]. To fulfill these qualifications, the cluster analysis was carried out on the basis of the factor values determined by the exploratory factor analysis, as this one has concentrated the initial variables to independent factors between which a correlation does no longer exist.

The cluster allocation with the help of k-means procedures needs an initial solution, where a number of clusters and cluster centers concerning certain characteristics are given. The assignment of the individual objects to the groups then takes place in a way that minimizes the sum of the squared deviations [Schlittgen, 2009, p. 405–406].

For the evaluation of the quality of the cluster solution — which means how far these clusters actually differ or rather how far the characteristics may be used for the differentiation of the clusters — the F-values and t-values can be used [Schendera, 2009, p. 65]. The F-values here describe the variances within the individual groups. The smaller the F-value in a group is, the smaller is the variance of the variable within a group in comparison to the total survey population. The F-value should therefore not exceed the value 1 as otherwise the variance within this group is bigger than in the survey population. A cluster can be judged as homogenous when all F-values are smaller than 1.

Contrary to that t-values can give information about the way a cluster may be characterized. A negative t-value says that the variable in the group in question is under-represented or rather below average (in comparison to the study entirety). A positive t-value on the other hand says that the variable in the group is over-represented or rather above average (in comparison to the study entirety). Consequently, t-values that differ much from zero can be consulted as typical characteristics of individual groups. In this work the value of 0.3 is set as the lower bound for an over- or rather under-representation [Schendera, 2009, p. 65].

After the final cluster solution had been determined, the results were interpreted accordingly. Here the midpoints of the clusters were used. Through a descriptive analysis, differences between the individual groups can be found. By using a catchy naming of the clusters the interpretation can become easier [Homburg and Krohmer, 2009, p. 367].

By carrying out the procedure described, the complete dataset was split up into the two groups PA cohort and PRIV cohort. Then, cluster analyses with these subgroups, based on the factor values determined before, were carried out.

For the PA cohort the result was a three cluster solution (Figure 1). The quality factors of this solution altogether have quite good results, as only the F-value for the strategic-economic tasks in the third group slightly exceeds the limit value of 1. Due to the exploratory nature of the present study this is not considered to be critical so that the results are interpreted as follows.

Following the classification of the tasks of a CIO in Daum et al. [2004], all groups were examined with view to their compliance with these tasks.

The first group ($N = 11$) shows an above-average shaping of the factor “strategic-technical tasks”. The factor “operational tasks” is slightly above-average, too and the factor

“strategic-economic tasks” is slightly below-average. In the overall interpretation, members of this group are called “IT architects with a focus on operational tasks”.

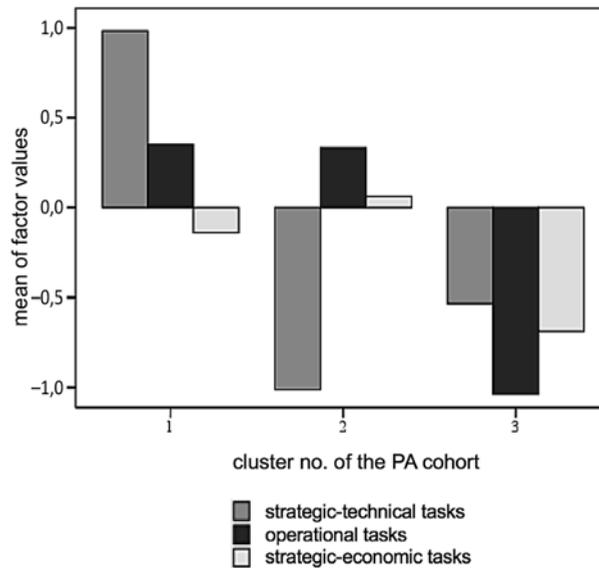


Figure 1. Results of the cluster analysis in the public administration (factor values for the PA cohort; $N = 39$).

In the second group ($N = 17$) the factor of the strategic-technical tasks is below-average, but the second factor of the operational tasks — like in the first group — is slightly over-average and the third factor of the strategic-economic tasks is on average. Therefore members of this group are described as “hands-on managers” with a very strong and exclusive focus on operational tasks.

The third group ($N = 11$) has below-average manifestations of the factor values at all three factors with the operational tasks standing out. Persons in this group could be called “IT representative”, as all factor values turn out very up to greatly negative and therefore no task is of over-average interest.

If we use the same procedure for the PRIV cohort, a four cluster solution is the result (Figure 2). The quality of this solution may also be referred to as acceptable, even if the F-value of the operational tasks for the groups one and two slightly exceeds the limit value of 1. With reference to the exploratory nature of this study and considering the small number of cases in the groups, this is not considered to be critical, so that an appropriate interpretation of the cluster result is performed.

The first group ($N = 2$) is characterized by an over-average manifestation of the second factor — the operational tasks — with the factors of the strategic-technical and strategic-economic tasks being below-average. Herewith this group puts the operational tasks in the center of attention and can therefore be called “administrator”.

The second group ($N = 8$) shows above-average values for the strategic-technical tasks, average values in the factor operational tasks and below-average values for the strategic-economic tasks. This allows it to characterize these persons as “IT architects”.

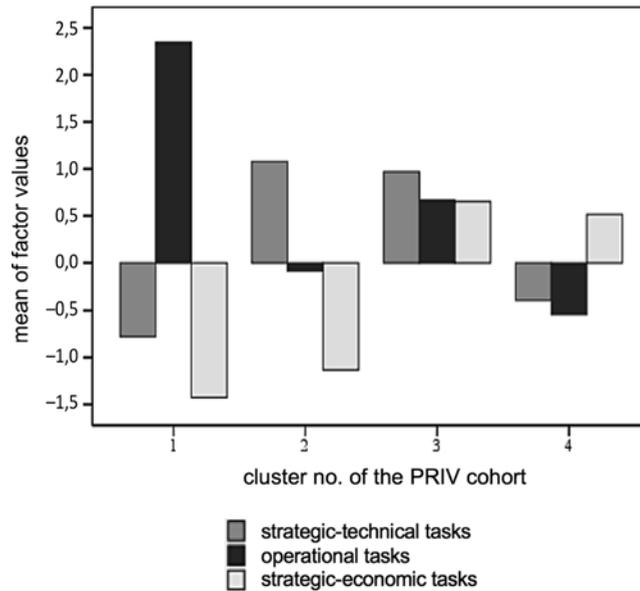


Figure 2. Results of the cluster analysis in the private sector (factor values for the PRIV cohort; $N = 45$).

Group three ($N = 14$) in all three factors has slightly above-average values, so that the members of this group could be described with the term „IT generalists“.

Group four ($N = 21$) shows slightly below-average values in the factors 1 and 2 and slightly above-average values in factor 3. By focusing on strategic-economic tasks, persons in this group are “IT service managers”.

If we compare now the results of the cluster analysis of the two cohorts PA and PRIV it becomes clear that the task profiles of CIOs in these sectors partly differ a lot from each other. Although the group “hands-on manager” in the PA cohort (group 2) and “administrator” in the PRIV cohort (group 1) as well as “IT architect with operational tasks” in the PA cohort (group 1) and “IT architect” in the PRIV cohort (group 2) have similarities, the other profiles cannot be found in the other sector respectively. So the profile “IT representative” only exists in the PA cohort and the profiles “IT generalist” and “IT service manager” only exist in the PRIV cohort.

To bring characteristics of CIOs out more clearly concerning the tasks in the individual sectors, in the following personality profiles were assigned to the individual task clusters. This makes it possible to examine, whether the persons that were charged with certain tasks, have different characteristics being helpful to carry out these tasks. As the variables for the recording of the characteristics were collected in form of a semantic differential, every single variable was divided into two variables with a symmetrical range of values. In addition the values were z-transformed to make the interpretation of the results easier. So, for the determination of individual persons’ profiles only the positive characteristics have to be looked at.

Concerning the PA cohort, the following characteristics profiles can be seen from the clusters (Figure 3). Members of the group 1 “IT architect with operational tasks” are

rather more technology-oriented, see IT as the content of job fulfilment, see themselves as specialists and are oriented internally. It becomes clear that the fulfilment of mainly strategic-technical and operational tasks is only assigned to persons having a focus on technology and see IT as their substantial work content and therefore feel themselves as internally-oriented specialists. Other characteristics in this group are rather on average. The prevailing characteristics also suggest calling the persons in question “IT architects”, so that the personality characteristics of this group of CIOs go very well with the associated range of tasks.

Members of the group 2 („hands-on manager“) have a slightly different character. Although these are rather specialists, too, and are focused internally, there also exists a clear thinking in costs connected to thinking in project cycles. Nevertheless these CIOs are rather qualified in leadership, orientate towards business processes and follow technical innovations. The characteristics available characterize these CIOs as “IT project managers” so that the CIO characteristics go very well with the typical tasks of a “hands-on manager”. This can be explained by the fact that such IT managers seem very much to be integrated into the operational tasks and additionally seem to realize already existing technological innovations in projects (connected with an orientation towards results and costs). Such IT managers are able to train others and also maintain the connection of their IT job to the business tasks of the organization.

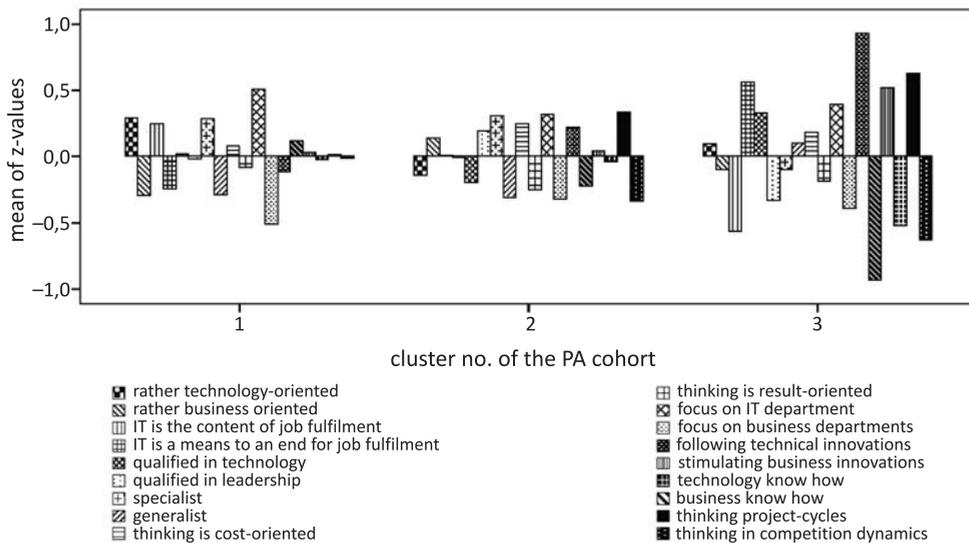


Figure 3. Characteristics of a CIO for the clusters of the PA cohort.

Those CIOs who realize the tasks of „IT representatives“ (group 3) are interested in technology, can be described as qualified in technology with a sound technology know how. Nevertheless such a CIO does not see IT as the content of job fulfilment, but rather as a means to an end for job fulfilment. He underlines the importance of following technical innovations very much and thinks in project cycles. He is rather orientated towards the IT department. In this case we talk about persons that — despite their strong focus on technology — seem to be very conscious about that this technology is not an end to itself

but has to serve a professional purpose accordingly. As a conclusion this group is called “technical pragmatists”.

The characteristics profiles of the clusters for the PRIV cohort show differences between the groups as well (Figure 4). In the first group, which mainly realizes “administrator” tasks, it can clearly be seen that these persons are very much orientated towards technology, are qualified in technology accordingly and therefore can be described as specialists who see IT as the content of their job fulfilment. In addition, they focus on the IT department and think in project cycles. As a conclusion these persons are called “head of data center” and it seems appropriate to assign them to the main focus “administration”.

The second group of the “IT architects” in comparison shows less striking characteristics. This group has an orientation towards competition and stimulates business innovations only slightly with all other characteristics being on average. This seems to correspond to the group of tasks of a strategic-technically-oriented CIO, who may see it as his duty to identify technical innovations and transfer them to the business departments and product development. Due to the very strong orientation towards competition (being accompanied by a change of the role model of the CIO) it could be implied that these CIOs move from a rather traditional to a modern view of their role in the company. Therefore, these persons could be described as “IT strategists”. It could be conjectured that because the members of these group are currently subject to change none of the other characteristics found is above-average.

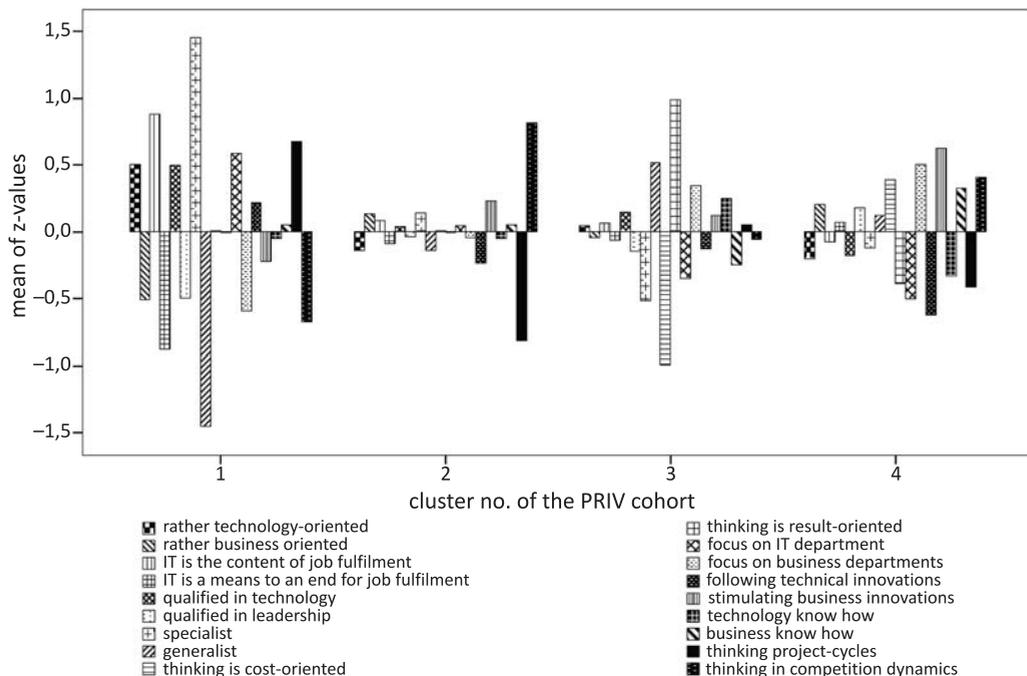


Figure 4. Characteristics of a CIO for the clusters of the PRIV cohort.

In task group three with a generalist mission, the self-conception of being an IT generalist becomes fittingly clear. Here the strongest thinking in results can be found

and the CIOs are rather orientated to the business departments (i.e externally instead of IT-internally). Nevertheless, these persons rather know about technology than business. Altogether the characteristics profile of this “result-oriented” CIO matches very well the group of tasks as it is nicely balanced.

In the fourth group („IT service managers“) CIOs can be found that focus externally on the business departments and therefore orientate towards the business processes. In addition they know about the business and orientate towards competition, which makes it possible for them to stimulate business innovations. Contrary to the IT strategist, who rather thinks strategic-technically, this groups is much more strategic-economic. They are rather generalists, qualified in leadership and think in costs. Again the characteristics profile of the “IT economist” seems to correspond very well with the group of tasks for an IT service manager. In Table 4 the results of the study are briefly summarized.

Table 4. Comparison of (catchy) job descriptions for CIOs and associated personality types of CIOs

Public administration CIO clusters			Private sector CIO clusters		
No	Job description	Type of CIO	No	Job description	Type of CIO
1	IT architect with operational tasks	IT architect	1	IT administrator	Head of data center
2	Hands-on manager	IT project manager	2	IT architect	IT strategist
3	IT representative	Technical pragmatist	3	IT generalist	Result-oriented
			4	IT service manager	IT economist

It is obvious that the characteristics of the CIOs partly differ to a large extent between the PA and the PRIV cohort. The types of CIOs cannot be compared directly with each other, but in both sectors are completely different personality types with appropriate job descriptions. In the PA cohort, we have the IT architect, who next to operational tasks mainly deals with strategic-technical tasks (for example the development of an IT strategy or planning of the application development). This type of CIO cannot be found in the PRIV cohort, but an IT strategist who has to carry out strategic-technical tasks as well, but has nothing to do with operational tasks at all. In the PA cohort also exists the CIO type of the IT project manager who carries out operational tasks (for example maintenance of IS or network management), partly works in the strategic-economic area, but is not orientated strategic-technically at all. In the PRIV cohort we find the head of the data center being comparable who works even more operationally, but contrary to the IT project manager is not active strategic-economically neither strategic-technically.

The other types from the PA and the PRIV cohorts are hardly comparable. Very distinctively we find the technical pragmatist in the PA cohort, who is described as an IT representative with very low values in all task areas, and in addition, concerning his characteristics, is slightly inconsistent and therefore hardly classifiable. In addition, we have the CIO type „results-oriented“ in the PRIV cohort, who as a generalist concerning the sphere of tasks focuses on strategic-technical as well as on operational and strategic-economic tasks. And finally, we have the “IT economist” who mainly acts strategic-economic.

4. Conclusion and Further Research

CIOs in public administration and the private sector are an integral part of their organization and a guarantor for the integration of information technology into the strategy and the operational procedures of the company or rather administration. Here the interpretations of what are the areas of responsibilities of a CIO differ considerably and go from the safeguarding of sheer operational tasks to the preparation and realization of strategic IT tasks and the organizational procedures needed for that. With the help of statistical procedures (factor analysis) these task descriptions were identified and summarized in the three groups “strategic-technical” tasks, “operational” tasks and “strategic-economic” tasks.

In a next step, in the frame of a cluster analysis we looked at how far these job descriptions can be really found among the CIOs asked. As a result groups could be formed again, in which the CIOs with a similar shaping concerning the task groups were summarized. Here we could see that the CIOs in public administration as compared to the private sector have very different ideas about their respective focus and sphere of tasks. Finally, we were able to match the different role models of a CIO with the typical personality types associated with this position.

Further research is necessary to examine whether the identified job descriptions and personality types of the CIOs correspond with the real demands of the areas public administration and private sector, and why we have these differences between them.

References

- Backhaus K., Erichson B., Plinke W., Weiber R.* Multivariate Analysemethoden. Eine anwendungsorientierte Einführung, 13 ed. Berlin: Springer, 2011. 414 S.
- Bartlett M. S.* The Effect of Standardization on a Chi Square Approximation in Factor Analysis // *Biometrika*. 1951. Vol. 38. P. 337–344.
- Baurschmid M.* Karriereentwicklung des Chief Information Officer (CIO) aus systemisch-konstruktivistischer Perspektive. PhD Dissertation, University of Duisburg-Essen, 2010. 298 S.
- Cattell R. B.* The Scree Test for the Number of Factors // *Multivariate Behav. Res.* 1966. Vol. 1, N 2. P. 245–276.
- Costello A., Osborne J.* Best Practices in Exploratory Factor Analysis: Four Recommendations for Getting the Most from Your Analysis // *Practical Assessment Research & Evaluation*. 2005, Vol. 10, N 7 [Electronic resource]. URL: <http://pareonline.net/getvn.asp?v=10&n=7> (accessed: 03.11.2014).
- Daum M., Häberle O., Lischka I., Krcmar H.* The Chief Information Officer in Germany — Some Empirical Findings // *Proc. of the 12th European Conference on Information Systems (ECIS 2004)* / ed. by Leino T. Turku, 2004. P. 439–446.
- Fantapié-Altobelli C.* Marktforschung Methoden–Anwendungen–Praxisbeispiele. Stuttgart: UTB, 2011.
- Goetze K. U., Schoop E.* IT-Governance durch Strategische Steuerung in den Kommunen? // *HMD– Praxis der Wirtschaftsinformatik*. 2006, Vol. 43, N 4. P. 59–67.
- Harman H. H., Jones W. H.* Factor Analysis by Minimizing Residuals (Minres) // *Psychometrika*. 1966. Vol. 31, N 3. P. 351–368.
- Hofte-Fankhauser K., Wälty H. F.* Marktforschung Grundlagen. 4 ed. Zürich, Compendio, 2012.
- Holtschke B., Heier H., Hummel T.* Quo Vadis CIO? Berlin: Springer, 2009. 188 p.
- Homburg C., Krohmer H.* Marketingmanagement. 3 ed. Wiesbaden. Gabler, 2009. 480 S.
- Kaiser H.* The Application of Electronic Computers to Factor Analysis // *Educational and Psychological Measurement*. 1960. Vol. 20. P. 141–151.
- Kaiser H. F., Rice J.* Little Jiffy, Mark 4 // *Educational and Psychological Measurement*. 1974. Vol. 34, N 1. P. 111–117.
- Krcmar H.* Informationsmanagement. 5 rev. ed. Berlin: Springer, 2010. 217 p.
- Laudon K. C., Laudon J. P., Schoder D.* Wirtschaftsinformatik — eine Einführung. 2 ed. München, Pearson, 2010.
- Mehlich H.* Electronic Government. Wiesbaden: Gabler, 2002.

- Raiche G., Walls T. A, Magis D., Riopel M., Blais J. G.* Non-Graphical Solutions for Cattell's Scree Test // *Europ. Journal of Res. Methods for the Behavioral and Social Sciences*. 2013. Vol. 9, N 1. P. 23–29.
- Ruscio J., Roche B.* Determining the Number of Factors to Retain in an Exploratory Factor Analysis Using Comparison Data of Known Factorial Structure // *Psychol. Assess.* 2012. Vol. 24, N 2. P. 282–292.
- Schendera C. F. G.* Clusteranalyse mit SPSS. München; Oldenbourg: Verlag, 2009. 440 S.
- Schlittgen R.* Multivariate Statistik. München, Oldenbourg, 2009.
- Schwertsik A. R., Wolf P., Krcmar H.* Evolution des Public Information Management — Eine Analyse des Standes 2009 in der Bundesrepublik Deutschland. Technical Report. Munich: University of Technology Munich, Chair of Business Informatics, 2011.

Статья поступила в редакцию 16 апреля 2015 г.