Observations from the current CIO surveys in Germany – linking CHEITA's global complexity index (GCI) to other factors and frameworks

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1. Abstract

The CIO surveys in German Higher Education Institutions (HEI) allow a unique access to the development process of different IT-Governance implementations across a diverse developed university culture. This culture is often influenced by the traditions, the history and local politics in a specific way but also with a large variety. Not at all surprisingly, the individual HEI only slowly adopts different practices which primarily had been developed in countries with high tuition rates and thus a greater need for cost control and overall guidance. This paper therefore investigates if and how an overall benefit is visible for those institutions which build and implement a specific IT-Governance.

The application of the global complexity index being developed by the CHEITA community as a baseline for comparison does reveal additional valuable insights. Especially the lack of payoff in the application of service management frameworks and increased benefit of the continuous awareness around information security becomes visible. Institutions investing in security awareness show a better spending rate in comparison to their peers on the GCI scale. Institutions spending their budget on the optimisation of the service portfolio fail to demonstrate their advantages. In general, bigger institutions allow their CIOs better to follow their goals. They also grant their CIOs effective access to the board of directors. In consequence, those CIOs can demonstrate a higher value of IT for their institutions.

2. Background

IT Governance has been addressed in German HEI for about 15 years. Initially, recommendations were given by the German Research Council (DFG) and other organisations (DINI, HRK, ZKI) in a general way (Deutsche Forschungsgemeinschaft, 2001; von der Heyde et al., 2009; Meyer-Doerpinghaus, 2012; Degkwitz & Schirmbacher, 2015; Deutsche Forschungsgemeinschaft, 2016). Several surveys were conducted to look into the development of IT Governance as case studies (Schwabe, 2009; Börgmann & Bick, 2011; Grönert, Pöppelbuß, & Breiter, 2014), from the perspective of the ICT departments (Hotzel, Wimmer, von der Heyde, & Lang, 2016), and also from a statistical point of view (von der Heyde, 2014a, 2014b, von der Heyde & Breiter, 2015, 2016).

Main questions in these quantitative surveys were:

- Are there typical models of IT Governance implemented?
- How do organisational processes change to support IT-Governance?
- What are the respective advantages of those models?
- Are there other indicators explaining the success of the different models?
- How does the financial situation link to the governance model?

Recently a more detailed comparison of various institutions (so called IT-Benchmarking) also started in Germany, linking the community to the benchmarking initiative of EUNIS and CHEITA.

2.1. Sizes of HEI in Germany

Generally, the sizes of HEI in Germany are very diverse (see Figure 1). A high number of specialized universities with few students lower the median to only 2620 students. The average of 7008 students indicates that majority of the students is enrolled in only a few HEI. This is important regarding the perceived necessity to establish IT Governance and IT strategy in HEI of larger sizes.
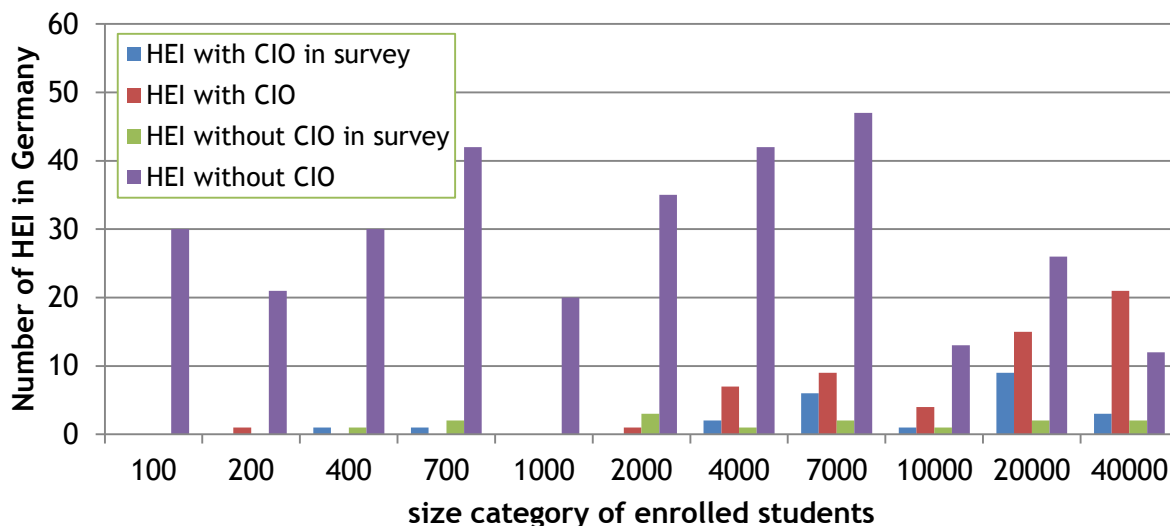

Figure 1: Number of HEI in Germany grouped by size with up to N students (Source: HRK statistics, May 2016). The participation in the CIO survey 2016 is split into separate columns. The number of institutions with CIOs was estimated on the basis of previous years' surveys.

The overview in Table 1 shows the number of institutions who participated in the 2016 survey. Again the total sum of students shows the concentration of large student population in the research oriented universities in contrast to schools of music and arts or the universities of applied sciences.

Table 1: Size of HEI in Germany in May 2016. In brackets the percentage who participated.

Type of HEI	Number	Sum of students	HE participants in survey 2016	HE institutions with CIO
Research oriented Universities	110	ca.1.740.000	23 (ca. 21%)	ca. 50
Schools of Music and Art	54	ca. 36.300	2 (ca. 4%)	ca. 5
Universities of Applied Sciences	228	ca. 968.000	17 (ca. 7%)	ca. 30
Sum	**392**	**ca. 2.750.000**	**42**	**ca. 85**

2.2. Participation in the CIO survey 2016

In the 2016 survey 42 HEI submitted data that is included in the further analysis. Table 2 shows the overall numbers which are represented by the 2015 and 2015 data sets. In proportion to all German HE institutions, the 2016 survey covered institutions with about 17,8% percent of the student population.

Table 2: Overall numbers *represented* by the 2015 and 2016 survey in comparison. In relation to the overall student population of Germany (2,75 Mio) the surveys cover a substantial part. Numbers in brackets indicate the number of datasets being included in the sums.

	Sum students	Stud. proportion	Sum budget	Sum staff	Sum IT budget
Survey 2015	401.939 (38)	14,6%	2.733 Mio (19)	57.671 (35)	24,4 Mio (27)
Survey 2016	490.303 (42)	17,8%	3.939 Mio (36)	67.079 (42)	46,4 Mio (18)

The t-test for the student numbers of all participating HEI in comparison to all HEI in Germany confirms a representative sample (p=0,023). For the sub-sample of those HEI where a GCI is known, the t-test results in p=0,025. The survey therefore covers a substantial part of the German HE landscape.

3. Method

The complexity index is defined as a linear combination of normalized number of students, number of employees, and research funding:

student_index	= min(10,1+9*(student full time equivalents / 45.000))
staff_index	= min(10,1+9*(staff full time equivalents / 18.000))
research_index	= min(10,1+9*(external research funding / 750.000.000))
complexity index	= student_index * 35% + staff_index * 35% + research_index * 30%

The complexity index is therefore by definition correlated to those values. It was originally developed including the various scaling factors by the Australian federation of HE (CAUDIT).

The Global Complexity Index (GCI) was adapted to reflect the currency and purchasing power of international HEI for the research_index as defined by CHEITA (Bergström et al., 2015).

This paper links data and further results of the German CIO survey 2016 (von der Heyde & Breiter, 2016) to the GCI. The survey data of 2016 was collected with a web based questionnaire send to the CIOs, IT directors or, if those could not be electronically located, to the board of directors of all German HE institutions. About 110 participants showed initial interest; however, only 42 completed the survey questions to a degree, that allowed further data analytics.

4. Results

The basic statistical analysis applying U-Tests shows not only the expected correlations of the GCI with size of the institutions, but also with

a) organisational aspects – e.g. the Governance model between central IT and the CIO,
b) the communication of the strategic value of IT,
c) the planning processes for the IT service portfolio,
d) the application of information security frameworks, and
e) the confidence of the CIOs to follow their goals.

Sometimes these aspects could statistically be correlated with the GCI or with the difference between the actual IT budget and the budget predicted by the GCI. In some cases, the statistical analysis did not indicate a clear correlation to the underlying factors of the GCI.
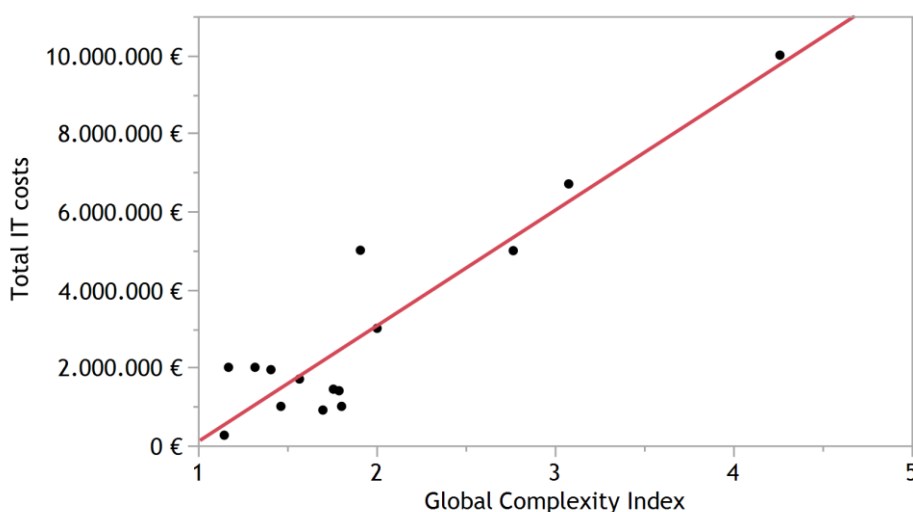
In general, the total IT spending of the institutions could be fitted linear to the GCI. The r^2 of 0,85 suggests that the major determining factors for IT spending are covered by the GCI. This confirms earlier reports (Bergström et al., 2016).

4.1. Access to the board of directors

Apparently there are relations between the GCI and the implementation of IT Governance. The ways CIOs have access to their boards of directors differ substantially with the GCI. Often institutions with a small GCI have not established any link between CIO and the board (average GCI 1,3, n=3). The average GCI for those inviting the CIO to the board when necessary is 2,2 (n=7). In some institutions (n=4) the CIO is member of the board (GCI average of 2,4). The highest average GCI of 3,3 have the institutions (n=4) where the CIO is permanent guest of the board granting constant access to the information, but leaving the decision domains within the board.


How is the CIO related to the board of directors?
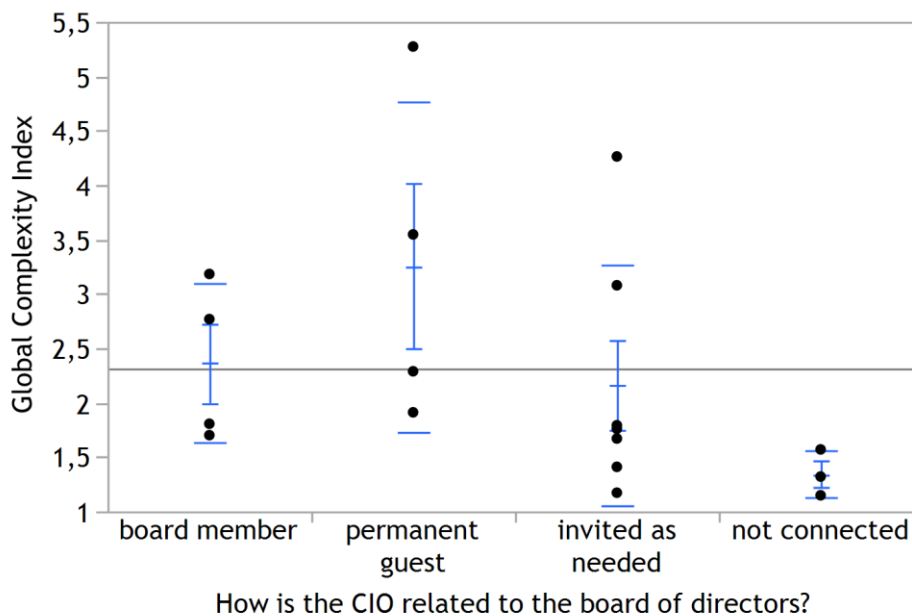
4.2. Strategic value

The communication of strategic value of IT also seems to be related to the GCI. Those who claim to have established this communication have a GCI of 3,1 on average, which is significantly higher than the rest of the HEI (average of 1,8 GCI). Surprisingly, this variable does not significantly correlate with the individual factors of the GCI (number of students, staff and research funding).


The strategic value of IT is communicated within the HEI
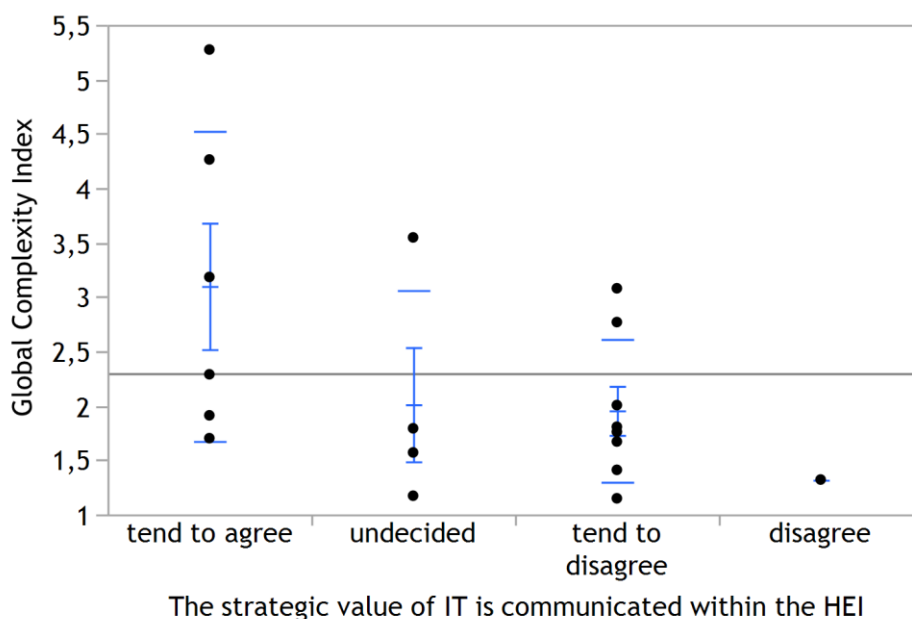
4.3. Optimisation of the Service Portfolio

The HE institutions who optimise their service portfolio in a defined process also tend to have a higher IT budget than the GCI would predict (about 1,1 Mio. €). In contrast, institutions who have a defined service portfolio but not a defined process to optimise it have roughly the budget the GCI would predict (on average 0,1 Mio € more). This does not confirm the common expectation that an optimised service portfolio reduces costs over all. In contrast, the service optimization required often more money than the GCI would predict.
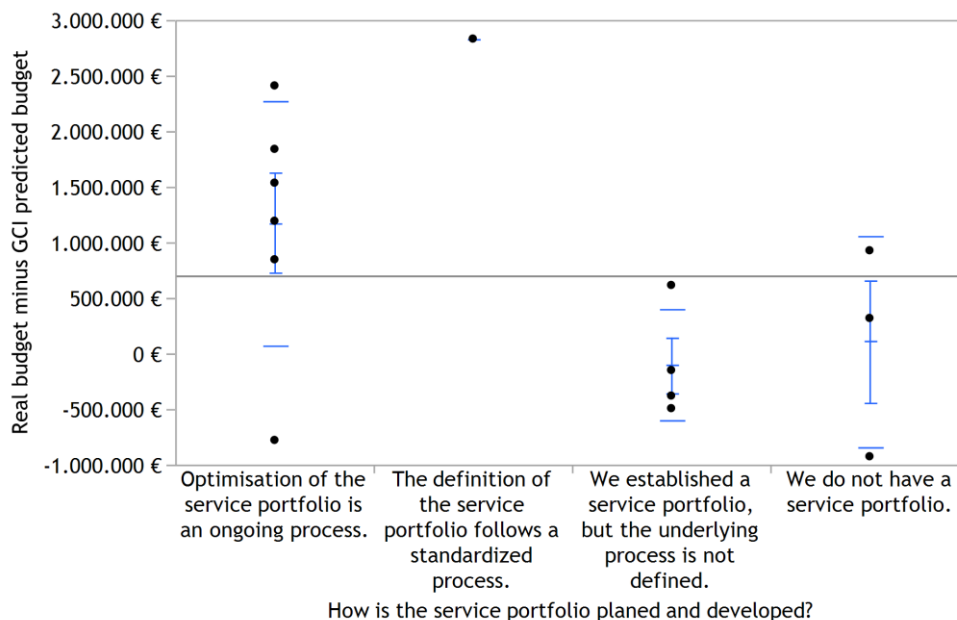

4.4. Information security is recognized

HEI where information security is recognized by the members as an important issue tend to need less money in comparison to their GCI predicted spending than those where information security has an unknown or not well established recognition. In other words, a good awareness in information security can potentially save money.
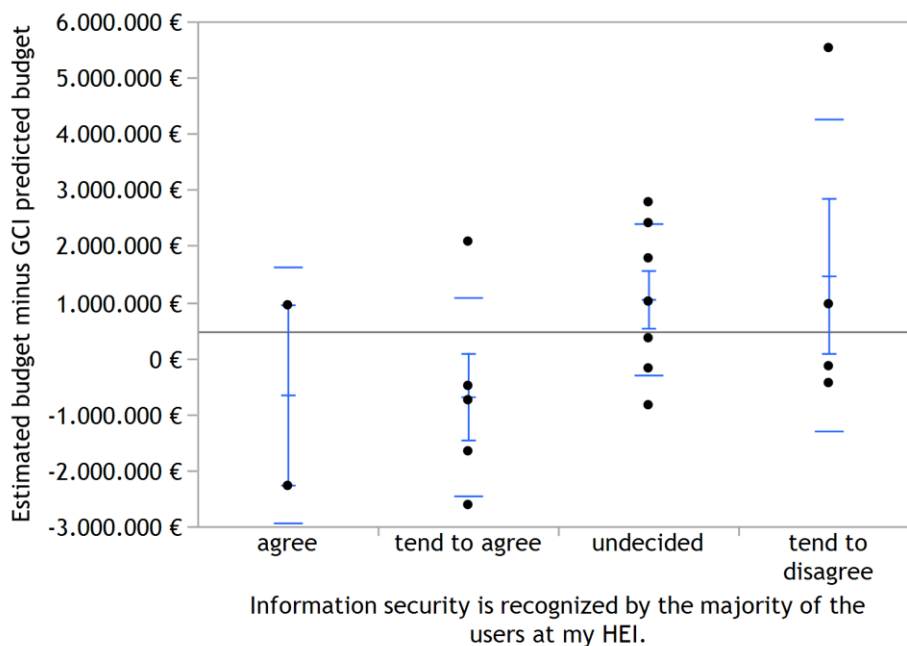
However, this is also intermixed with other factors like the size of the organisation being correlated with the GCI. So far information security is mostly recognized in its importance by universities with a GCI above 1,8 (average round 3,0). This leaves the universities with an average of 1,6 GCI with incomplete awareness for information security issues.

Information security is recognized by the majority of the users at my HEI.
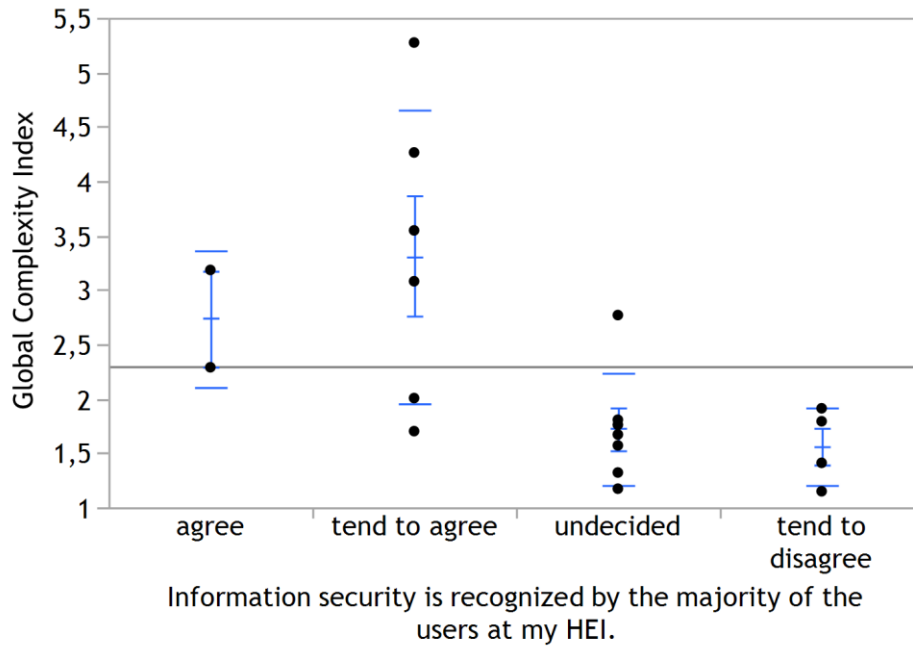
4.5. CIOs are able to follow their goals

CIOs who report to be able to follow their goals coherently are often located at HE institutions with an average GCI of about 2,8. Others who are either unsure or reject this statement are mostly at institutions with a GCI below 2,4 and with average around 1,6. This confirms the higher flexibility of bigger institutions to support their CIOs in the efforts to organise IT.

I can follow my goals for the IT at my HEI.
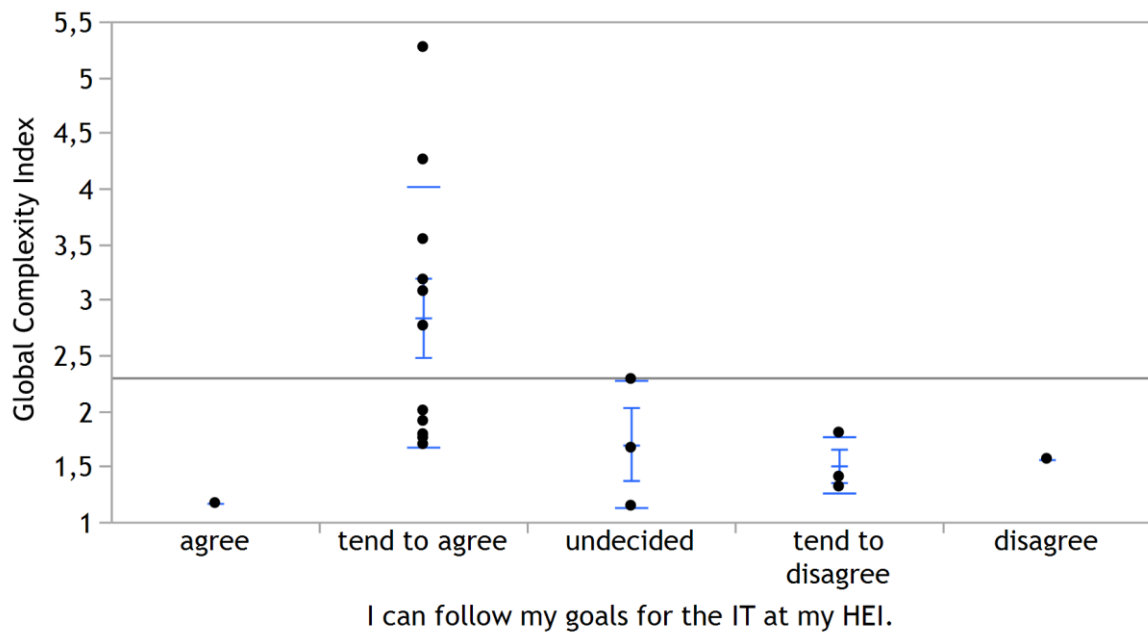
5. Summary and outlook

The CIO surveys in German HE allow a unique access to the development process of different IT-Governance implementations. Our research in this paper focuses on the link between different governance aspects, the processes around the service portfolio, the awareness of information security, and correlations to the global complexity index (GCI).

The expected payoff to optimise the HE service portfolio could not be observed, but in contrast to expectations, we observed higher costs for optimised service portfolios.

The continuous awareness of information security pays off. Institutions with a higher awareness spend on average less money based on the predictions we concluded from the GCI on IT spending.

Large institutions allow their CIOs better to realize their goals and communicate the strategic value of IT. We hypothesis the underlying cause is the effective access of the CIO to the board of directors at the these HEI.

Further investigations are needed to understand the underlying causes for our observations. Additional valuable input would be expected by the international comparison of our findings within the EUNIS community.

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7. Authors' Biographies

Dr. Markus von der Heyde received his PhD in Computer Sciences from the University of Bielefeld for his work at the Max Planck Institute for Biological Cybernetics Tübingen in 2000. His approach is to adopt biological principles into distributed computer applications in order to enhance stability and robustness.

Since 2004 he has worked within ZKI on topics as information security, service-management, strategy and governance. Until 2011 he was ICT director of Bauhaus-University in Weimar. Until today he also focuses on internationalization and supports ZKI, GI, EUNIS and EDUCAUSE and serves as program committee member as well as a proposal reviewer for conferences and the scientific community. In cooperation with various partners he conducts the German CIO studies since 2014. Today, he is management consultant specialized on IT topics in higher education. More details on https://www.researchgate.net/profile/Markus_Von_Der_Heyde3.

Prof. Dr. Andreas Breiter is Professor for Information Management and Education Technologies at the University of Bremen and Scientific Director of the Institute for Information Management Bremen GmbH (ifib). His main areas of expertise are IT-Management, IT Service Management and IT-Controlling, Information Management in Education, E-Learning-platforms as well as Mediatization. He also chair of working group 3.7 (IT in Educational Management) of the International Federation of Information Processing (IFIP), member of the Association for Computing Machinery (ACM) and also member of the Gesellschaft für Medizinische Datenverarbeitung und Statistik (GMDS). See further details on https://www.researchgate.net/profile/Andreas_Breiter.