Process documentation as estimate for effective IT Governance

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Abstract: In organizations the overall work is split into tasks which are often referred to as processes. It is debatable if the tasks and procedures need to be documented or not. Does documenting processes of information technology (IT) make a difference for the organization? We have evidence that in higher education organizations in Germany, many institutions suffered in the past from the lack of documentation of IT. In this paper, we will present data that confirms advantages beyond the scope of the IT itself for organizations such as those universities who care for the documentation of the processes. The 2016 data from a survey in the German higher education system is analyzed specifically when looking at the question of pure existence of documentation of IT processes. How is this trivial view interlinked with other factors of the CIO structure, the IT financial situation, and many more? We observed that universities with IT process documentation on average a) spend more money on staff, b) get more value from IT, c) care for service level agreements, d) have higher security awareness, and e) have less shadow IT and being more centralized. Our findings are in line with proposition of BPMM, COBIT, ITIL and other frameworks, thus we support the emphasis on process orientation of IT including a solid documentation.

Keywords: IT Governance, University, CIO, Processes, Documentation

1   Motivation

The Object Management Group (OMG) defines the term "process" in the context of the Business Process Maturity Model (BPMM) as "a set of tasks or activities performed to achieve a given purpose or a specified result." The traditional OMG meaning is stated as "documented procedure for performing some task within an organization e.g. software construction, payroll, order processing etc.)." [OMG08]. The main difference of both definitions is the documentation of the performed procedure or task. Does already this definition suggest a connection between the maturity of an organization and the documentation of the processes?

The German higher Education system is slowly adopting standards known to industry for years. This is taking the IT-Service departments through a series of changes on all levels. Higher Education Institutions (HEIs) are of particular interest as they have to

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meet expectations with conflicting goals in three sometimes very distinct areas: a) teaching and learning, b) research and data infrastructure and services, c) administrative IT services. Hence, IT governance has specific challenges. As public organizations, this includes governance structures and processes which are deeply rooted in traditional routines of public services. HEIs in Germany resemble rather public administrations than competitive research enterprises. It is noteworthy, that the common differences between research focused universities and the universities of applied sciences have been decreased by politics and other factors. Thus we expect the mechanisms for the effective use of IT to be more similar in the future between those two types of universities.

Meanwhile the recommendations by government agencies (e.g. The German Research Foundation, DFG) have not changed: HEIs in Germany (both universities and universities of applied sciences) being mostly independent from influence of politics have been requested to establish a central CIO function for more than 15 years [DFG01, DFG16]. Moreover, several not-for-profit-organizations emphasized the need to follow international recognized frameworks (e.G. ITIL or [ISO08]) [He08, GP11, HRK13, DS 15]. Both recommendations are only fulfilled to a limited degree. However, results from case studies within the higher education sector [Mo05, BB11] as well as the public administrations in Germany [BF11, GP14] confirmed successful implementations of the ITIL and COBIT framework respectively.

Looking at German Universities, one of the first with a statistical approach to measure maturity level of the IT governance was Schwabe [Sc10]. Later studies focused on the IT-Governance structure [WL14, He14, HB15] and the conditions in which a model would be advantageous. So far, there had been no confirmation of the success of process frameworks from a significant amount of universities. Therefore we used the data collection primarily focusing on CIO and Governance structures in Germany [HB16], the relation to IT benchmarking in the form of the complexity index [HB17] and analyzed the data concerning the question of successful process framework application.

One could argue that even without a good documentation, an IT organization can be effective; when everyone knows what to do, everything should run smoothly. Unfortunately sometimes common sense needs proof when it comes to the management of IT. In this paper, we are interested in measuring to which degree the documentation of tasks is connected with other factors of an IT organization and the maturity of this organization overall.

2   Method

The overview in Table 1 shows the number of institutions who participated in the 2016 survey on "IT-Governance and CIO structures". 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.

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**

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

In a web-based questionnaire, representatives from German universities (CIOs, ICT directors or members of the board of directors) indicated the implemented IT Governance by describing participation in decision processes (as referred to by Weill and Ross [WR04]). The representatives also were asked to judge using several general statements about their institution and their personal view on contributing factors. In addition we collected a small subset of data on the actual institution otherwise used in benchmarking initiatives (see CAUDIT, EDUCAUSE Core Data Service and the EUNIS BencHEIT initiative). These numbers indicated the overall spending on IT, the size of the ICT department as well as the size of the university by means of student population, total staff size and research income.

In total, 128 people participated in the online survey. Unfortunately only 42 representatives from different universities provided enough data to be part of the actual analysis. The data was checked for plausibility and changed with permission of the participant where applicable. Afterwards all data was anonymized to eliminate prejudgments for the analytical phase. Within this group of 42 universities several datasets were not complete. Specifically only 24 institutions answered the survey block being relevant for this paper.

The data was analysed with U-test (also known as Wilcoxon-Mann-Whitney-Test). Therefore, we divided the group of universities based on their answer to one specific question. For example: the usage of an IT governance framework. The comparison of the two groups by means of the U-tests was conducted with a confidence level of 95% (error level of 5% respectively) for other judgements. This paper reports the average for each of the two groups, the standard deviation, the U-value-level appropriate for the group size at 5% significance level, as well as the actual relevant U-value of the statistical test.

3 Results

This paper focusses on results in connection to the statement: "The processes involved in the use of information technology (IT) at my university are not well documented." as

translated from the German original "Die Prozesse zur IT-Versorgung an meiner Hochschule sind schlecht dokumentiert." As expected the 24 answers varied on a five point scale (average 3.3, std. dev. 0.85) as shown in Table 2. We divided the dataset into two groups of equal sizes below the mean and above. Group 1 disagreed with the statement, thus claimed to have good documentation of IT processes at their university. Group 2 was either undecided or admitted to the potential deficit and therefore marked in red.

Actual verbal rating	Numerical score	Count	
I fully agree	1	-	
I partly agree	2	5	group 2
In between	3	7	
I partly disagree	4	11	group 1
I fully disagree	5	1	

Table 2: The table shows the histogram of all 24 ratings concerning the main statement, if process documentation of IT processes exists. The upper three cases (12 answers) are group into group 2; the lower two cases (also 12 answers) into group 1 for the further analysis.

The two groups were compared in more detail. In an explorative approach our predictions followed the above mentioned frameworks: Statements confirming an ordered IT support and statements indicating the use of those frameworks should reveal statistical differences in the two groups. For all U-Tests, also the reverse test was conducted to confirm whether or not the statement arguably adds to the question of cause and effect.

Table 3 gives us an overview of all U-tests with a significant result below the 5% level. All lines but one compare two groups with equal group sizes of 12 resulting in a U-value limit of 36 for the 5% level of significance. The data on staff costs were again incomplete in three cases leaving group 1 with 10 members und group 2 with 11 members (in this case the U-value limit is 26 for the 5% level of significance).

Mean gr. 1	Mean gr. 2	Std. dev.	U-value	English translation of the original statements
1.6	3.0	1.0	13.5	← We train our IT staff and develop competencies according to the tasks. {M}
67.3	47.5	17.5	16.0	(←)Average costs of IT staff {in 1000 € per full time equivalent, group size 10 and 11}

67%	8%	48%	30.0	← We cover the IT costs of the library within our IT cost estimate. {Yes/No}
2.0	3.5	1.1	18.0	← Our IT adds value for the success of the university. {M}
1.8	3.2	1.2	23.5	← The university appreciates and honors the commitment of IT. {S}
2.6	3.5	1.0	35.0	The flexibility of the IT organization matches the demand of the university. {S}
2.3	3.5	1.1	27.0	← We discuss IT services with our customers openly and transparently. {S}
3.3	4.3	0.9	28.0	For the IT-services we agreed on service level agreements (SLA) with our customers or their representatives. {S}
3.6	2.6	1.1	35.5	The delivery of our IT services is nonbinding and informal (e.g. by best effort). {S}
83%	17%	50%	24.0	← Information security is used for the complete institution according to standards. {Yes/No}
3.8	1.6	2.3	31.0	← The sum of the frameworks used for the complete university. {range 0 to 10}
3.2	4.4	1.4	36.5	Number of decision domains the central IT department is involved in. {range 0 to 5}
4.0	2.8	1.2	29.0	We have many different IT service providers within our university. {S}
5.0	4.2	0.8	36.0	We have no IT service at university level. {S}
3.6	2.3	1.2	30.5	We have a high rate of shadow IT at our university. {S}

Table 3: This table gives overview of all statements which reveal any significant difference for the two main groups. If the reversal U-test for the respective groups showed a significant difference for the main groups a "←" is added. The brackets indicate the scale of the statements the participants judged on or the numerical range respectively. Most statements were rated on the same five point scale as the original question as indicated with the {S} label. Two statements followed a five point scale similar to a maturity rating {M}. For the staff costs we asked the participants about staff size and total staff costs enabling us to calculate average costs per full time equivalent. The number of decision domains is going back to the domains defined by Weill and Ross [WR04].

Surprisingly, we did not find any correlation with the size of the institutions in the two groups [gr 1: 1455 FTE; gr 2: 1211; std. dev. 1516; not significant]. Nor did the overall IT spending of the universities shows any significant effect. Further, the variance of universities of applied sciences as well as the occurrence of music and art schools was not significantly different between the two groups.

4   Interpretations

In general, correlations like our observations do not indicate any causal relation. However, we argue that in many cases the underlying CIO structures, the general culture, and other factors at those institutions are the common base and actual causal source for observed correlations as observed by others [MS03, Ma11, HS16]. New management approaches go beyond the traditional service oriented principles and demand a culture of innovation [KA16]. However, those principles have to prove a consistent advantage in the future.

An in depth factor analysis was performed but showed no clear clusters that would allow a better understanding and therefore is not presented. Consequently, we grouped the statements in thematic categories following the proposed benefits of the common known IT frameworks. Let us revise some of the statements in more detail, grouped by the appropriate topic.

4.1   Overall cost of staff and professional training

We group the statements and variables into this section:

1. We train our IT staff and develop competencies according to the tasks.
2. Average costs of IT staff [in 1000 € per full time equivalent].
3. We cover the IT costs of the library within our IT cost estimate.

Group 1 (having some documentation about IT processes) strongly indicated (on average 1.6) having a plan in place for staff development (1) in contrast to group 2 (being on average undecided = 3.0). The IT staffs presumably are sent regularly to advanced trainings. This naturally enhances the competencies as well vice versa. Higher qualified staff more often asks for advance training in order to keep up with the general technical development.

We also observed nearly a 20 thousand Euro increased cost per full time equivalent (2) for group 1. The cost of IT staff in group 1 is 140% in comparison to the staff in group 2. This would also confirm the hypothesis, that highly trained staff understands the importance of a process documentation better.

Finally, the idea of having the library staff within the IT costs indicates for group 1 a higher integration of IT service and governance structure overall (3). Otherwise most

universities are very often unaware of the costs between different service units (central IT department and library for example). Within group 1 were the only three participants indicating the joint IT general service center for learning systems, administration and library confirming this view to some degree.

4.2   Value, commitment and flexibility of IT

We group the statements and variables into this section:

1. Our IT adds value for the success of the university.
2. The university appreciates and honors the commitment of IT.
3. The flexibility of the IT organization matches the demand of the university.

The application of COBIT, ValIT, and other frameworks often is motivated by the increase of the business –IT alignment resulting in an overall increased value of IT. Our two questions addressed exactly this proposition and the results confirm at least that those who implemented processes and documented them also believe in the result being visible (1). Not only the self-reports about increased value, but also the reflection of the University's judgement is indicated by the corresponding statement (2). Finally, even slightly significant results confirm the increase of flexibility having implemented IT processes in an orderly fashion (3). Often IT departments argue against the introduction of frameworks with a potential loss in flexibility which cannot be confirmed by our results. Group 1 agreed with all three statements whereas group 2 mostly rejected the three statements. Furthermore, the reversal U-test did not show a significant result.

4.3   IT Service Management

We group the statements and variables into this section:

1. We discuss IT services with our customers openly and transparently.
2. For the IT-services we agreed on service level agreements (SLA) with our customers or their representatives.
3. The delivery of our IT services is nonbinding and informal (e.g. by best effort).

All three statements are in direct or reverse alignment with ideas from IT Service Management: Statements (1) and (2) fit the predication having those with documented IT processes more often agree in contrast to those without documentation. Note that only the first statement also revealed a reversed significance; the other two did not. The agreement with statement (3) fits the predication, but reverses the logic: Here the universities without documentation (group 2) agree more often, since any informal service being delivered based on "best effort", does not require any documentation. Universities with service level agreements in place (group 1) have some documentation and therefore provide consequently services with an acceptance criterion more defined than "best effort".

4.4   Information security, governance and other frameworks

We grouped the statements and variables into this section:

1. Information security is used for the complete institution according to standards.
2. The sum of the frameworks used for the complete university.
3. Number of decision domains the ICT department is involved in.

When we broaden the view and also consider information security (1), we mostly observed a consistent answer from the participants. In each group, we noticed that two of the participants' answers veered from a direct relation in the main question. Those universities who established information security frameworks by definition follow some processes in IT. Therefore these universities who denied having processes but confirmed the overall application of information security might have misunderstood the question. Two other universities confirmed having the security in place, but do not follow any documentation. Overall these questions leave us with a consistency of 80% of the answers in this particular case of group 1.

For the reported number of overall frameworks we took the average sum of the indicated frameworks in a checklist (2). The potential maximal sum was 10. The frameworks in place differed between those universities of group 2 (with on average 1.6 framework in place) indicating no particular pattern. Again two universities in this group controversially indicated the overall use of the ITIL framework and therefore should be able to provide some documentation about their IT processes.

Not surprisingly both statements also reveal a significant reversed U-test. If information security is already implemented an appropriate process documentation is to be expected. As most frameworks are based on some documentation the second reversal seems trivial.

Finally, the number of decision domains as elaborated on in previous studies [He14, HB15, HB16] indicated in respect to the main statement that the involvement of the central IT department in to many decision processes (like in group 2) might not always be advisable (3). Those universities with a better documentation (group 1) the ICT department still takes part in decisions, but is reduced by more than one domain on average. This confirms earlier hypotheses were a CIO in place takes over some of the decision responsibilities and also frees the ICT to concentrate more on the service delivery.

4.5   Decentralized IT

We group the statements and variables into this section:

1. We have many different IT departments within our university.
2. We have no IT service at university level.
3. We have a high rate of shadow IT at our university.

The drawback situation of shadow IT and many departments not working closely together seems to be manifested by the last block of statements. First of all, there are more different players in the game (1) as well as less overall IT-Services in place (2). Last but not least the existence of shadow IT (statement 3) is a strong indicator for the lack of documentation (group 2) and the clear benefit of the application of standard frameworks as COBIT, IT Service Management and many others within group 1.

All statements do not reveal a reversed significant U-Test. Therefore, it could be hypothesized that the organization of IT either central or decentral does not determine the level of documentation in itself. In sum, those statements are a good indicator but do not provide any insight in cause and effect relations.

5   Summary

The presented results confirm that for the most part, there is a widely accepted relationship between process documentation and an effective IT management as well as IT service delivery also exists in the German higher education sector. The often made claim and belief that you need to differ too much to be able to apply common frameworks proved once more to be wrong. The opposite can be derived: IT organizations with a documented process orientation generate higher value and appear more flexible despite all formality of service level agreements. Based on correlations with of maturity measures this confirms the central role of a good documentation of IT processes.

Finally, IT departments with documented processes add more value to the universities. This in turn leads to a higher acceptance. Overall, the professional culture of a well-organized IT department seems to be prerequisite of a mature IT alignment, which manifest the change from a service provider to a business enabler.

Acknowledgments

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