



# University's Core Business - How digitalization and cooperation affect IT's value proposition and metrics

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## Abstract

Until now, IT departments run a multitude of systems and components in order to offer services to their University's users. Nowadays, many of the same IT departments find themselves also in the role of a broker between their users and services obtained from community cloud or public cloud providers. In such an environment, it's inevitable to complement traditional IT metrics by metrics that are aligned to the users' needs in order to measure the contribution of IT.

## 1 Introduction

Almost all areas within a university – teaching, research, and administration – work with IT tools in innumerable use cases. Even if these tools are highly specialized and administered directly by the people that use them, at some level of the stack of layered applications and virtualized environments we enter the part that is run by “the IT”, perhaps in itself a stack consisting of departmental and central IT\*.

In order to deliver good services, and to support the university's processes, IT units strive to optimize what they do and the way they do. This optimization often relies on typical, well accepted parameters for the quality function, like availability, scalability, efficiency, performance, security, process adherence (ITSM), utilization, etc., and there's no doubt about the suitability of these criteria to measure the quality of IT services. But despite the fact that reliability, security etc. are inevitable properties, these metrics leave gaps. Therefore, the question remains whether the aforementioned IT metrics fully cover the needs and benefits of users. In this paper we show examples of this gap from different surveys and elucidate the question of outcome-oriented metrics in the context of changing IT environments and the rise of cloud computing.

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\* Whenever we say “IT” throughout this paper we mean a university's central IT department.

## 2 Expectations and needs

These gaps lie between the IT centric metrics and the value (D.Eppinger, 2000) (Piller, 2015) a particular service contributes to all universities' core businesses, education and research. In other words, to what extent is this contribution of a particular service dependent on those classic quality parameters? Or vice versa, which level of those parameters is sufficient to reach the intended core business contribution? And, on the other side, the users' expectations towards IT.

The first reason for the existence of these gaps lies at the point that these criteria force the users to map their expectations onto IT specific metrics. All of us are used to this, and, of course, we are happy with an IT service that shows a 24\*7 availability. However, these criteria do not reflect the benefit to the users in his or her terms: To what degree does an IT service contribute to teaching? To making experiments and to writing publications?

So, while a particular IT service might be perfect by IT's own metrics, the value in the sense of a university's core business might be unclear.

Consequently, in our view, a metric that correlates IT and outcome with respect to a university's core processes is crucial for IT's further development.

We believe that very much of the usefulness of IT from a scientist's perspective is created by the convenience a particular IT service can be integrated in a scientists' or team's natural workflow and supports this workflow. So, beside the "real", measured IT services, this convenience is often defined by the "glue" between them, like seamless login, ubiquitous access, integration in existing services, etc.

An example where this workflow integration showed up as an issue where expectations and service offering diverged was discovered in a survey about data backup services: Backup and restore as a "technical" process worked perfectly, but the users have specific demands where specific tasks should be carried out. In particular, the majority wants to have the ability to define backup services for computer systems and the ability to initiate restore operations at any time as a user in the case of personal devices like laptops, and by the IT staff at departmental level for other systems. Consequently, these demands impose the requirement for self-service capabilities for this particular service.

To illustrate the second gap, we can take the results of a short survey conducted as part of another project "federated identity management". Here, scientists who are active in research or teaching were asked whether they would like to use the mentioned services alone and/or collaboratively with other users. Figure 1 shows that almost 26% of the respondents would like to use services alone and 37% would like to use collaborative services with other users<sup>†</sup>. But about 53% of the participants did not even know about possible services offered by other universities inside their state.

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<sup>†</sup> respondents could mark multiple answers

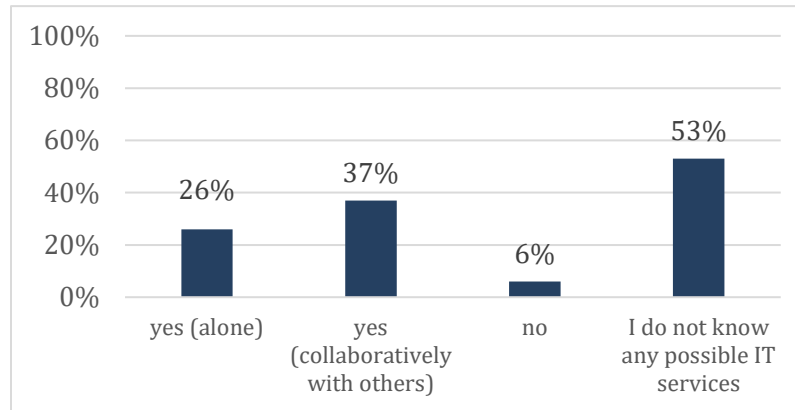


Fig. 1: Results of the scientists to the question: “Do you want to use IT services offered by other universities inside your state?”

These results show an important gap in the perception of IT services from the user perspective and from IT’s perspective. The first question that comes to mind in this context is how users can indicate the value proposition of a service if they do not know which services are available for use? In this context, many users would like to see an overview of IT services and the uniform dissemination of information at the universities.

Given the variety and number of services that universities have been offering for years, the question remains open as to how it can be that users lack this information. How can IT organizations have taken the requirements of users into account when implementing IT services if users themselves are not aware of the existence of the services? Conversely, it can be asked how the value proposition for users can be determined if no requirements were previously recorded.

Other results from the survey show clear wishes and complaints from users, which are mentioned below. One of the more frequently mentioned wishes is easy access to services without a per-service registration, personal advance arrangements or complex application processes. The time required for this is an identifiable gap for users that is not currently being filled by traditional IT metrics. It was also noted that users can mainly use the services of their own university. This is contrary to the desire for collaborative working.

Furthermore, the insufficient supply of online literature and the lack of access to libraries were criticized. Based on this feedback, IT should identify the value proposition that is important to users and develop appropriate metrics to address their needs.

In a third survey many users complained about several tasks not working. As part of a university’s IT, our first thought was something like “so read the manual”. But the complaints clearly show that, at least in the eyes of some users, parts of the user documentation fail to pick up them either at the point of knowledge where they are or – more often – explains things in an “IT-ish” manner, not really considering the users’ focus of interest or their expectation. In this context, the users want good documentation and the provision of application examples to better understand the functionalities.

So, in essence, we observe IT services that are not adequately documented or even unknown to users and we see unsatisfied demand for different services. This said, conventional IT metrics show high service availability or scalability etc., but they do not necessarily reflect user needs and requirements. Thus, to our opinion, IT metrics should be expanded in a way that they not only focus on service operations, but also on service functionality as a whole. The same applies not only to on premise services, but also to future cloud solutions. Another result of the abovementioned short survey of federated identity management shows that the survey participants would like to see standardized, simple cloud solutions that comply with data protection requirements. How traditional IT should position itself

in general with regard to cloud solutions and which IT metrics now play a role (particularly in connection with user needs) will be examined in more detail in the next chapter.

### 3 The Cloud

The previous part dealt with the IT still being the sole provider for the local user community of each university.

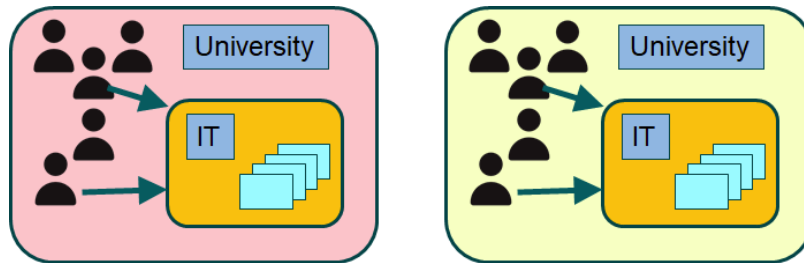


Fig. 2: Users and IT of different universities

With greater virtualization of the IT service architecture, organizations can respond much to new requirements. It is crucial for organizations to find the right mix, the right sourcing strategy of on-premises and cloud infrastructures since to our belief a strict cloud-avoiding strategy is not a viable approach. To implement such a mixed-source strategy, previous silo structures must be broken down, processes must be much more automated and more flexible (Sachse, 2013) (Dittrich & Eifert, 2019). This approach relieves the IT departments in many ways and saves resources. On the one hand, the operation and maintenance of IT resources is strongly reduced and, on the other hand, the technology-related, dynamic distribution of IT services across multiple locations enables a new way of working such as e-collaboration between employees and partners.

So nowadays we have ubiquitous (and still fast growing) use of public or community cloud services and users that collaborate in a way that they have to use various resources supplied by a multitude of providers (s. fig. 2). Another recent survey<sup>‡</sup> showed that many users want to have access to compute resources, particularly in the field of machine learning and data analysis. However, the overwhelming part of the answers show that collaboration is the major issue, the “simple” sharing of content within teams, tools for organization like shared calendars, shared document editing etc. Since it is common (or even required by funding regulations) to form cross university project teams it is inevitable to offer suitable infrastructure. There are even some IT departments that build up local resources for their users (“they asked for it, didn’t they?”) which shows a misconception of the users’ demands: they didn’t ask for a technical platform but for an infrastructure that supports global collaboration.

In consequence, the direct relation is not necessarily given. Additionally, from all experiences so far, the public cloud providers outperform any IT department in the areas of availability and scalability, and most probably in other areas as well. And in the case of a community cloud, there is “a different IT” that has to maintain the classic performance indicators. In the same time, the providers of academic community clouds have to provide services to people outside their organization.

<sup>‡</sup> Gündogan, A., Picksmeier, C., to be published

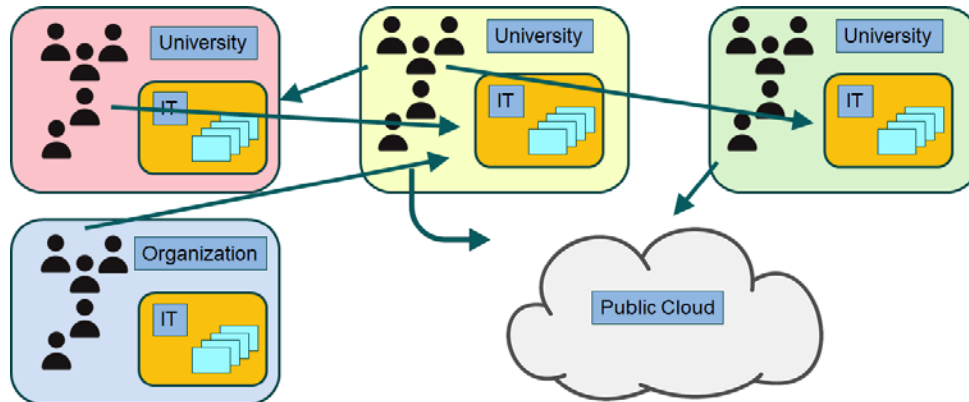


Fig. 3: Users from several universities and other organizations using various resources.

In such a scenario at last it is inevitable for IT to redefine its contribution to a university's business processes - the traditional metrics do not work anymore.

The comparison between fig. 1 and 2 shows a grown degree of complexity. While the first reaction might be to avoid this, the chance for IT lies in embracing it: To our experience users want to utilize the services, but they do not want to - and often are not able to - handle this complexity. Processes to enable the use of cloud services of any kind in an organized manner, integration with university identity management for AAI processes as well as for seamless cross-resource workflows are some of IT's possible contributions. Building research-oriented services like centers of competence for cloud software development, microservice architecture and so on are further developments.

IT managers in universities are challenged to develop new and innovative approaches to data management. At the same time, the data centers have to reposition themselves and provide IT services for departments faster and more flexibly. Scientists, teachers and students are increasingly comparing the IT services of universities with services freely offered on the market and are quite used to using cloud services, including the advantages that come along. For the universities, a solution approach in the implementation of hybrid IT infrastructures in their own data center is very obvious (Moeller, 2016). This means that data and applications that are critical for the facility (e.g. personal data) remain in the company's own data center, while particularly standardized systems and data can be relocated to the public cloud. It is thus possible to tap the best possible IT resources depending on the requirements and the cost / benefit aspects. The university's IT can thus increase its agility and performance as well as the speed of provision and react flexibly to new tasks. An important instrument here is the provision of IT resources from the cloud, considering a previously defined uniform strategy. Because it is not expedient to obtain IT resources from different cloud providers without properly integrating them within the entire IT landscape. Otherwise, isolated and incompatible data silos will be built. In this way, IT remains in full control of the data and the data can be moved between cloud resources as required.

In consequence, as a mediator of cloud services, the IT still has to deal with the classic IT metrics, simply to specify the quality of the received cloud services. So, while IT is deprived of many of those tasks that can be quantified with classic metrics, the inclusion of cloud services in IT's service spectrum increases the pressure and the chance to define extended, value-oriented metrics.

The primary goal in the further development of IT environments in educational and research institutions should therefore be the continuous adaptation of the solutions to the constantly changing requirements of scientists and students.

## 4 Our Approach

Our approach is to realign IT quality metrics to the contribution to the users' core business. It is clear that such a metric will most probably be "fuzzier" than the well-established metrics, and that it will be less standardized than the conventional metrics.

As one reason we see that IT services serve different "classes" of users: We have services for individuals independent of their role, like authentication, Wi-Fi access, personal e-mail etc. Then there is a class of services we call "for departments", like server infrastructure, departmental network connectivity, backup services etc. These services have in common that the "users" of each department are represented by departmental IT staff. And finally, there are the services that are meant to directly support the scientists, like HPC, platforms for data analysis etc. For the last group, the departmental IT staff might also be involved, but in a role different from running the departmental IT.

What we try to show here is that IT's approach of standardization of metrics meets users or "customers" with different roles and thus with different expectations to IT services.

Following that, IT needs separate dialogue forums to communicate with the different roles. Often, the individuals – the students in particular – already have such a dialogue established. The same holds for the departmental IT. And perhaps there too is a dialogue established on the "strategic level". The "normal" scientists on the other hand appear quite underrepresented in such a dialogue: The local IT staff has different expertise and a different job. And the departments' heads often are no more involved in the intricacies of "real life IT". But these intricacies are important for whether or not any IT service might be easily integrated into a scientific workflow.

Considering the three identified user groups individuals, departments and scientists (there might even be more, if you look closer) and their needs, it becomes clear that not only the way needs are described has to be adjusted to the user group, but also the metrics depend on them. For departments, represented by IT staff, "old" metrics are still valid. Individuals represent a broad mass of people with different backgrounds, so metrics that fit all are expected to be "fuzzy", like: easy to use, barrier-free, etc. Scientists, or any other user group sharing a specific background, form their needs out of a particular process. Thus, it is more specific, e.g. supporting process of data storage and sharing information with external project partners or integration in existing tools A and B.

The third point is that the approach used in the dialogue has to be switched:

Currently, existing dialogues takes place mostly in terms of IT. Not only departmental IT staff, but many scientists know (more or less) about IT, and map their demands onto (existing) IT solutions and ask for these. Usually, IT is happy with this approach. The disadvantage is clear: it opens a gap and does not find the optimum, but only a known solution. The reshaped dialogues should be about what users want to achieve (their „Job-to-be-done“) and put more trust – and more demand – in IT to find a suitable solution. On the other hand, this requires IT to accept the "invitation" to talk about scientists' demands.

On the one hand, the communication and interaction of both sides leads to an optimization of existing service processes, resulting in a significantly "better" value proposition for users/beneficiaries. On the other hand, future services can be aligned with user requirements by not only considering the classic IT metrics, but also supplementing them with other metrics that are relevant for the user. The form of communication can vary here depending on the organization. While in some organizations the users are collected through suitable workshops, other organizations can carry out targeted surveys to find out the wishes and expectations of the users with regard to e.g. certain services.

Taking all this into account it concludes that to find the right quality criteria for an IT service you have to 1. Identify user groups for this IT service, 2. Eventually find metrics for each user group, where applicable. For the specification of the precise contribution of a service or a set of services to the core business we are somewhat reserved to suggest a metric. As Peter Fleming (Fleming, 2021) – among

others – points out, metrics tend to detach from their original intention and start to establish themselves as goals on their own. So, instead of striving for a metric that tries to capture the benefit of IT services for research and education we see the way for improving this benefit in increasing IT's understanding of the ideas as well as the pains scientists encounter during their work. In consequence, the scientists and IT gain a common understanding of pains and gains and how IT can support and contribute here even on the top of outsourced services, as the “glue” that stays necessary in the cloud age.

The communication channels currently used are either based on an asynchronous exchange on information. This applies for support means like email, documentation, etc. A vehicle to achieve the goals mentioned above is a direct dialogue with the user groups. Here it is essential to choose the right conversational partner who has the right knowledge background, i.e. a broad and deep knowledge concerning IT in general, the existing IT services and current technology developments.

From the typical IT perspective, such an informal dialogue – perhaps in the form of a “fireplace talk” – looks incredibly expensive and inefficient due to its bad scalability. However, we are convinced that such a format leads to a much more outcome-oriented IT and by that an improved contribution and such fosters the core business. So, from a ROI perspective we regard this as a rewarding effort.

## 5 Perspective

We are convinced that IT has to adopt its contribution to research and teaching more directly in its performance indicators as it is common nowadays. This will be an effortful, “expensive” way, and there will be the challenge not to drown in an unmanageable heap of individual demands and micro solutions – IT has to maintain a high degree of scalability. But despite these challenges we here see the future of IT, to evolve from a service provider (which might get interchangeable with growing part of cloud service usage) to a true partner which adds his specific competencies to reach the university's goals.

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## 6 Author biographies



**Dr. Thomas Eifert**, received his doctoral degree in solid state physics. Since 2013 he holds the role of the CTO and is thus responsible for the technological strategy of the IT Center. His particular interests are the mutual dependencies of researchers' requirements and appropriate technical solutions, his teaching focuses on scalable IT.



**Denise Dittrich, M.Sc** is working at the RWTH Aachen University's IT Center since 2005. She received her Master Degree in Artificial Intelligence from Maastricht University in 2009. From 2010-2012 she was deputy head of the IT-ServiceDesk, thereafter responsible for IT Process support and Identity and Role Management. Since 2016, she is deputy head of the department for Systems&Operation with her focus on providing large-scale central services like Groupware, Identity Management and Collaboration platforms. Furthermore, she is the main contact for the management of cloud computing.



**Aylin Gündogan, M. Sc.**, joined the IT Center at RWTH Aachen University in 2019. She completed her Master in Business Administration - Operations Research and Management at RWTH Aachen University in 2019. In 2019, she joined the Systems and Operations department as a project manager for the Federated Identity Management project.