Essential IT capabilities for a successful digital transformation in Higher Education

Pekka Kähkipuro[1]

[1]Brunel University London, Kingston Lane, Uxbridge, UB8 3PH, United Kingdom, pekka.kahkipuro@brunel.ac.uk

1. ABSTRACT

This paper discusses digital transformation within higher education and proposes a layered capability model for structuring the required IT capabilities. Changes related to digital transformation are taking place in most institutions and, while there are differences in the selected approaches, similarities can also be observed across the sector. To define the landscape, we use two frameworks to describe those changes. On one hand, we characterise various aspects of the digital transformation in higher education at the institutional level and, on the other hand, we analyse the new expectations for the role of IT within institution due to this change.

Our observations lead to the identification of a layered model of essential IT capabilities that are needed to cope with the ongoing change. We propose to use three layers. Firstly, *basic capabilities* are needed to provide a solid foundation for digital transformation within the organisation. These capabilities have already been part of best practices in traditional IT provision, but they are paramount to any attempt to engage in a digital transformation. Secondly, *standard capabilities* will be needed to maintain competitiveness in the ongoing change and will be essential for all institutions that are aiming at keeping abreast with their peers in the increasingly digital higher education business. Thirdly, *advanced capabilities* will be developed by those institutions that are aiming at using digital business as a competitive advantage. A single institution might not be able to excel in all these capabilities and, consequently, it is assumed that only a subset of them will be implemented in each organisation.

Due to the diversity of the higher education sector and the ongoing innovation in the digital business, this paper is not intended to provide a comprehensive list of the required IT capabilities. Instead, it describes an approach that can be used to evaluate and transform the IT function of any institution to provide sufficient support for the institution's digital future.

2. DIGITAL TRANSFORMATION IN HIGHER EDUCATION

Digital transformation in different ways, the growing value of digital business, and the increased impact of information technology have all been significant change factors for all businesses for a couple of years. Each sector is experiencing a slightly different version of this phenomenon at the strategic level (Matt, Hess, Benlian, 2015). Within the higher education sector, we can observe several changes and new opportunities arising as illustrated by Figure 1 (Kähkipuro, 2015).

External changes are visible to the outside world and influence the way the institution operates towards its stakeholders. For example, the business model of the institution might change with the introduction of on-line and blended learning models. We have seen interesting partnerships between institutions and organisations that provide online courses for them on a revenue sharing basis (Newton, 2016). In the same way, institutions can use different digital tools, such as portals, mobile applications and social media, to change the student experience all the way through from the start of the recruitment process to their entry to the alumni stage. Similar externally visible changes may be implemented for other stakeholders as well.
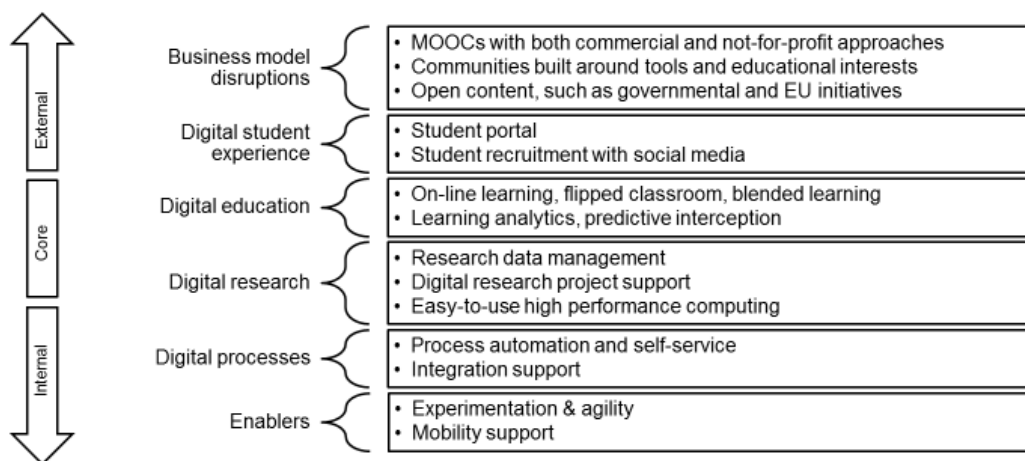
Figure 1. Aspects of digital transformation in Higher Education.

There will also be changes affecting directly both education and research, i.e. the *core business*. On the educational side, online learning practices and traditional methodologies can be combined in different ways to support blended and online learning. The use of digital technologies will also enable supporting activities, such as digital assessment, learning analytics and early interception, to be conducted in news ways, see e.g. (Davies, Mullan, Feldman, 2017). On the research side, the emergence of open access, open data and other digital opportunities will change the scenery. Also, high performance computing and other numerical techniques will be available for a broader group of researchers in domains where such techniques have not been used in the past.

There will also be *internal changes* in the way institutions operate. Institutions will be able to improve their working practices by using modern tools and techniques and by integrating existing tools with new ones. Productivity of individuals will increase from the increased support for mobility, cloud services and other new technologies.

3. THE ROLE OF THE IT FUNCTION

The above changes describe the aspirations at the institutional level. However, to implement the desired change, there is a need to support the transformation at all levels of the organization. One of the most critical elements is the role of the IT function.

To analyse the change, we use a simple framework for classifying the role of the IT function within an organisation. The framework has been adopted from a model initially suggested by Gartner Inc. (Gartner, 2014). Figure 2 illustrates the framework and how typical IT organisations in higher education position themselves. The 'Orientation' dimension indicates how much the IT function is involved in running the business-as-usual versus how transformational it is. Transformational aspects may, for example, be related to increasing personal productivity through external services or new technologies even if this improvement is not directly based to the use of corporate tools. The 'Focus' dimension is about the visibility of the IT services and how much internal and external exposure it gets. Typically, an IT organisation gets external visibility through partnering with other units.

In most cases, an IT organisation operates in all four sectors of the framework, but the focus tends to be in the lower left corner, in the 'engine room'. To a lesser extent, IT can be involved in joint service initiatives with other service unites (upper left corner) and in supporting exploratory use of digital technologies (lower right corner). Some institutions have taken a strong step towards online provision and this is when IT is also visible in the core activities (upper right corner).
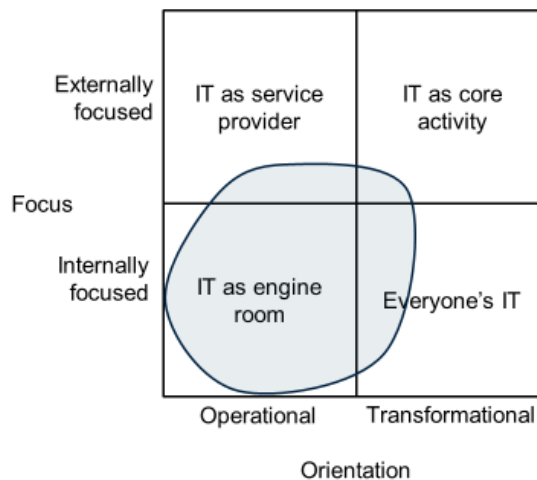
Figure 2. Typical role of the IT function in higher education.

4. FIVE AREAS OF CHANGE FOR THE IT FUNCTION

The requirements for digital transformation discussed in section 2 manifest themselves in a number of forces visible to the IT organisation. At least the following forces can be observed:

1. IT is expected to be more involved in providing services beyond traditional IT. Typical examples include automated HR services for the staff and administrative services for the students. Also, IT's own service provision is expected to turn from technology support into a broader range of services, such as access to electronic information resources.

2. IT is expected to support the increase of personal productivity of staff and students by providing support for mobility, bring-your-own-devices, external cloud services and new technologies.

3. IT needs to be increasingly involved in the core activities of the institution. In education, this involves work with areas like online learning tools, digital assessment and learning analytics. In research, new requirements for open access, open data and numerical methodologies among other things tend to consume an increasing part of IT resources.

4. Due to the increased focus on the above items, less resources will be available for traditional IT work and, consequently, there is a need to shift part of the traditional infrastructure work outside the organisation. New partnering and procurement practices will be needed.

5. The shift of focus in the above elements will require new management practices: the IT provision needs to move from technology to services and, ideally, to a true partnership with the rest of the organisation.

Figure 3 illustrates these five forces using the framework introduced in the previous section. We will illustrate these five areas with several examples in the rest of this section.
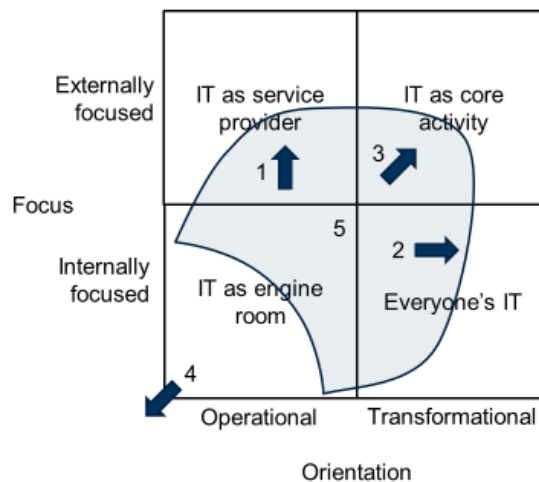
Figure 3. Five areas of change for the IT function.

1. From infrastructure to services. In the future, the IT function is expected to provide a robust and agile platform for all services independent on whether they are intended for internal or external customers. This typically includes a combination of new capabilities, such as

- Tools and processes for Identity and Access Management to enable automation and self-service,
- Tools and processes for consistent service management within and outside IT,
- Basic integration capabilities and an Enterprise Service Bus,
- Advanced integration and service orchestration capabilities,
- Tools for automation and self-service,
- Ability co-operate with other service functions to create joint service processes.

2. Improved personal productivity. The IT function is expected to provide agile support for all kinds of personal productivity improvements independent on whether the technology is provided by the organisation itself or by an external supplier. Support will be needed for new services, new devices and new applications. Typical examples include

- Technical support for using bring-your-own-devices (e.g. seamless network access),
- Integration with selected cloud services and corporate systems,
- Legal support for using external services. This can range from a list of recommended services to corporate level agreements with selected service providers,
- Cloud-like user experience for corporate systems so that they can be accessed with any kind of client devices,
- Mobility support on-campus and off-campus.

3. Greater role in core business. In higher education, with the availability of highly sophisticated digital tools for education and research, there is clearly a demand for the IT function to take a broader role. Typical examples include tools and processes for the following (Kahkipuro, 2015):

- Online learning, flipped classrooms, blended learning, digital assessment,
- Learning analytics, attendance monitoring, predictive interception,
- Research data management,
- Digital research project support,
- Easy-to-use high performance computing.

4. Step away from traditional IT. To keep the amount of IT resources under control, and to shift the focus into new areas, there is a need to abandon part of the traditional IT work, especially work related to the infrastructure. Typical examples in this area include the following:

- Change the primary strategy from 'make' to 'buy'. This may include a *cloud first* strategy and gradual outsourcing of selected parts of the IT infrastructure (van Gaver, 2016).

- Change the back-end approach from 'operations' to 'service delivery'. With this change, the IT organisation will be able to use external partners in many cases where they have traditionally been implementing the full service by themselves,

- Extend the skill set for the IT staff in the areas of service procurement and outsourcing.

5. New management practices. Less focus for traditional IT will require an explicit change in management style and IT's goals. This will be visible at all levels. Examples include:

- Change in the organisation, such as merging IT with other service functions or introducing a matrix model where IT matters are better integrated with the rest of the business,

- The introduction of a Project Management Office to support the organisation, including the IT, to improve the management of business change,

- Change the customer facing approach from an 'IT service desk' to a 'one stop shop' that will be able to deal with technical and non-technical problems alike,

- Extend the skills of the IT staff for engaging with the rest of the organisation (e.g. business analyst skills, procurement skills and change management skills),

- Enable projects with multiple modes: both agile and traditional projects have their place,

- Update the IT governance. Change the IT board to be more business focused, introduce business relationship management practices into the organisation, and publish an IT strategy that addresses needs beyond technology.

- Extend data security beyond the technical domain to encompass all relevant aspects of security, including data privacy and governance practices.

Essentially, the last item turns 'customers' into 'partners' and enables the IT organisation to manage its own destiny as part of the entire institution.

5. LAYERED CAPABILITY MODEL

The above list of identified requirements might look overwhelmingly long and difficult to implement. However, for an institution to be able succeed in the increasingly digital world, these requirements can be arranged into a prioritised set of capabilities to provide a more accessible way to deal with the change. To this end, we have defined a layered capability model with the following three layers:

- *Basic capabilities*: these capabilities have been part of IT best practices for years but digital transformation had made them essential for a sustainable future. Failing to implement them properly will seriously affect the institution's future in the digital world.

- *Standard capabilities*: these capabilities are required to be in the mainstream but do not provide any competitive advantage. These capabilities will define the norm for future higher education institutions.

- *Advanced capabilities*: these capabilities can be a source of competitive advantage, and not all of them need to be implemented in a single organisation. Typically, such capabilities are not only related to information technology but also to one or more additional aspects of the institution.

Within each layer, we have loosely identified capabilities that are related to technologies and services and those that are focused on the organisation and processes. The borderline between these two categories is not exact and most capabilities have elements on both sides. See (Daub, Wiesinger, 2015) for a more generic view on digital capabilities and how organisations can acquire them.

Figure 4 illustrates the layered capability model populated with capabilities that are directly related to the requirements identified in the previous sections. Due to the diversity of the higher education sector, the figure is not intended to be a comprehensive representation of the ongoing digital

transformation. Instead, it provides a structure and examples to help institutions to assess their own capabilities in order the define their strategy work.

Capability type	Technology and services		Organisation and processes
Basic	Identity and Access Management Service Management Enterprise Service Bus Enterprise Architecture Cyber security technologies		Basic project management Transparent and managed IT structure Business focused IT governance Basic integration support Data security and privacy governance and management
Standard	Process integration Automation and self-service User experience understanding Technical support for BYOD Mobility support Learning analytics Blended learning support Support for standard cloud services		Vendor management Agile project management Legal cloud support Service procurement Business relationship management Business analyst skills One stop shop customer service Strategy driven IT leadership
Advanced	Research data management Digital research project support Facilitated High Performance Computing Online course creation capabilities Fully integrated digital learning toolkit Widespread public cloud utilisation		Radical make or buy selections Multimodal project portfolio Outsourcing Partnering with the business Partnering with suppliers Digital marketing and omnichannel CRM capabilities

Figure 4. Layered IT capability model for digital transformation in higher education.

The *basic layer* is an area where the IT organisation needs to catch up with industry best practices. To start working on these capabilities does not require any significant changes in IT's role or goals, and appropriate projects can be typically initiated using existing governance mechanisms. There is a solid business case for each one of them even without reference to the digital transformation.

The *standard layer* provides the most challenging part of the oncoming work, as it will require the involvement of the entire organisation, significant technical investments and changes in the governance model. One of the most challenging parts will be the establishment of an IT leadership model that links IT (and the underlying digital capabilities) to the institutional strategy. Such a leadership model will speed up the creation of the other standard capabilities but, even then, the work will require several years if the starting point is a typical higher education institution. For an institution to be at par with the rest of the industry, most standard capabilities need to be present. This layer will define the new norm for higher education IT.

Finally, the *advanced layer* needs to be addressed differently. Rather than spreading resources in multiple directions, institutions will need to align their advanced digital capabilities with their institutional strategy. This way, resources will be used in the most efficient way and digital transformation can provide a source of differentiation. Projects at this layer need to be treated not as 'IT projects' but as strategic business projects, and they should ideally be managed as a part of the institution's strategic project portfolio.

There are natural interdependencies between the capabilities and some of them have been indicated by the connecting lines in Figure 4. For example, a technical capability may be connected to one or more related capabilities on the organisational side. Such dependencies point out the need to achieve results on one side before being able to progress on the other side. Some of the dependencies extend over the layers and indicate prerequisites for an organisation to be able to proceed to the next layer.

The capability model does not make any assumptions on the structure of the IT function. The same capabilities can be implemented with both distributed and centralised organisations. Also, the same capabilities can exist in the presence of a separate 'digital organisation' or in a structure where the same IT organisation is responsible for both the new and the old worlds.

There is an embedded positive message underlying the above analysis. While it is quite clear that the traditional IT service function in higher education will not be enough for the institutions to remain competitive, it is clearly possible to develop the existing IT function to deal with the new requirements.

6. SUMMARY

In the beginning of this paper, we have identified several changes brought about by the digital transformation at higher education institutions. Some of the changes will be visible externally, some of them will address the core activities, and some of them will have mostly internal implications. In addition, we also identified several forces affecting the role of the IT function within the institutions. Again, significant changes are expected to take place in the IT service provision.

To address the above requirements, institutions will need to increase their IT capabilities in different ways. To this end, we have introduced a *layered capability model* with three layers. The *basic layer* collects those capabilities that are part of traditional IT and have become essential in the digital era. The *standard layer* consists of capabilities that are required for institutions to stay in the mainstream in the future. The *advanced layer* provides capabilities for differentiation.

The capability model directs institution to address different layers in different ways. The basic layer can be addressed using traditional IT methodologies and governance models. The standard layer will require more work from the organisation, but it will become the new norm for IT in higher education and, hence, it is important to start working on these elements as soon as possible even in the presence of added organisational friction. Finally, the advanced layer provides means for strategic differentiation and needs to be addressed as a part of the institution's strategic portfolio.

The presented set of institutional aspirations might be typical for some organisations but institutions should take their own strategies as the starting point and follow the same steps to create their own list of required IT capabilities. Due to the different strategic directions taken by different organisations, there will be significant variations at the advanced layer and, consequently, the ensuing implementation projects will look very different. This is clearly an area of further research.

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8. AUTHOR'S BIOGRAPHY

Pekka Kähkipuro is Chief Information Officer at Brunel University London since 2016. He is heading the Information Services Directorate responsible for both ICT and Library services. Prior to joining Brunel, Pekka was Director of IT at Aalto University in Finland in 2010-2016 and, before that, he held various senior roles in the private sector including Nokia. He was EUNIS board member in 2011-2015 and the President in 2015. Pekka obtained his Ph.D. in computer science from the University of Helsinki in 2000.