Citizen Developers Driving the Digital Campus

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1. Summary

What could a university look like that has successfully entered the digital age? This question has been intensively discussed at three Swiss universities of applied sciences, which are currently in a merger process. The result is a holistic architecture for a *digital campus* that not only covers infrastructural aspects, but also contains content-, skills-, management- and culture-related building blocks for a comprehensively digitalized university. The deliberate active involvement of campus citizens as so-called *citizen developers* by guiding and supporting their hands-on participation in the university's digitalization efforts is identified as an important leverage for implementing the digital campus.

2. A Holistic Comprehension of the Digital Campus

There is hardly any other megatrend that currently affects society, companies, institutions and individuals as comprehensively as the digital transformation (Stone, 2019). Dealing with the raising opportunities and risks is prior - a development that is of course leaving its mark also in higher education: Curricula in practically all disciplines are expected to take the cross-sectional topic of digitalization appropriately into account, and the universities are doing their utmost to meet this existing demand.

Actually, universities are challenged in two dimensions with regard to the digital transformation:

(1) *What* the university transports to the outside world, namely domain-specific teaching content, research results, consultations, etc., should take the topic of digital transformation with its respective technical, organizational, legal and cultural aspects adequately and well balanced into account.

(2) Furthermore, *how* (to what extend digital*)* a university operates internally and at its interfaces should keep pace with an increasingly competitive environment, while ensuring that learning objectives are best achieved, and cost are kept at reasonable levels.

Table 1 summarizes a selection of essential goals tackling these two challenges, and the corresponding components of an architecture implementing a digital campus according to the goals. Assembling the derived components leads to Figure 1 illustrating the *holistic architecture* of a digital campus.

Table 1: Goals and components of a digital campus

Challenge		Goal	Comprised by architecture component		
(1)	Adequate balanced covering of the cross-sectional topic of digitalization	Setup systematic review of the curriculum and research focus to adjust them if necessary	Curricular Content on Digitalization, Digitalization in Research		Governance, Digital & Sharing Culture, Digital Codex
		Create opportunities for academic personnel and students to gather practical know-how in digital transformation	Digital Competences Students and Academic Personnel		
(2)	Learning objectives are best achieved	On a physically distributed campus, establish state-of-the-art teaching and learning methods utilizing digital means	Digital Teaching and Learning	Digital Media	
		Ensure Learning Success	Digital Control and Support Systems		
	'Customer journeys' of (prospective) students, academic personnel etc. should meet expectations that are more and more determined by increasingly inspiring user experiences off campus	Provision of an end-to-end digitalization of the essential learning, teaching, research and administrative processes tailored to occasional users in the form of one-stop-shops	Digital Services, Digital Competences Staff		
		Establish an omni-channel CRM/Web-CMS approach that supports entire 'customer' lifecycles and helps to ensure that the university is optimally perceived by the outside world, so that its reputation gradually improves			
		Establish culture and digital means for a highly effective collaboration	Digital Knowledge Communities		
	Efficient administration	Provide end-to-end digitalization of administrative processes tailored for power users	Digital University Administration		
	The necessary infrastructural basis exists		Facility/IT Infrastructure		

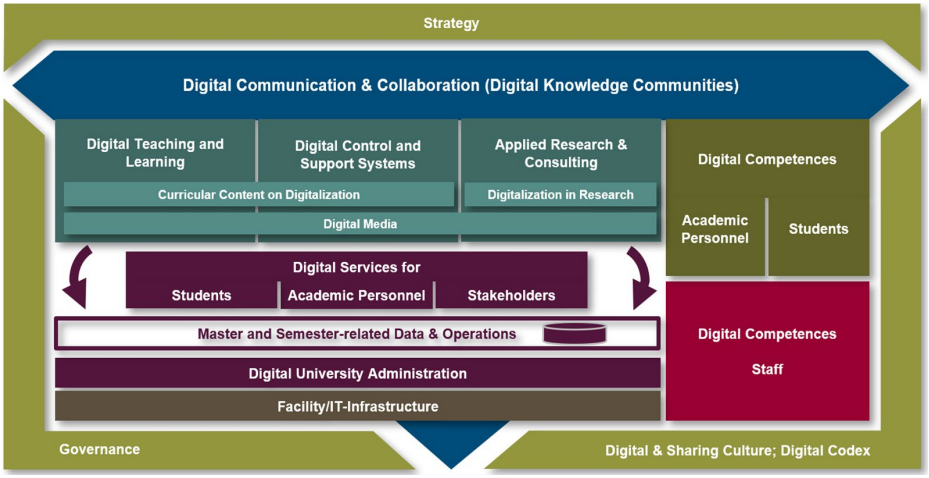

Figure 1: Holistic architecture of a digital campus

Challenges, goals and architecture were derived from a series of workshops on the design of a joint digital campus, which were conducted by delegates from the three currently merging universities of applied sciences, Buchs, Rapperswil and St. Gallen, in eastern Switzerland.

Part of the architecture is an application programming interface (API) as a managed shared service providing the essential master and semester-related data from a central source of defined quality, as well as secured operations on the data including the necessary authentication and authorization functionalities (Stone, 2019). It serves the applications of the central Digital University Administration and Digital Services for students, academic personnel and other stakeholders. In addition, it is part of the technological basis for scaling the implementation of the digital campus described in section 3.

3. Scaling the Implementation of the Digital Campus

One of the goals related to challenge (1) is considered in more detail: Creating opportunities for academic personnel and students to gather practical know-how in digital transformation – for these *campus citizens*, how could such opportunities look like? This goal arose from the finding that an in-depth and balanced view of the phenomenon of digital transformation is best achieved with a culture of 'not just talking about digital transformation but living it'. Enabling opportunities *on campus* for a hands-on, eventually experimental approach to digitalization is proposed as *one* possible measure to promote this "digital" culture, and thus to meet challenge (1). It is self-evident to take these opportunities from the stock of digitalization ideas implied by challenge (2): involve interested campus citizens in digitalizing their daily knowledge work, teamwork, courses, research or administration processes, empower them to digitally experiment in class, and so on. In other words, campus citizens cover parts of the digitalization of their own environment and thus learn to better understand the concept of digital transformation - their own digital campus as a 'lab for the digitalization of knowledge organizations'.

What is utilized here is the concept of *citizen development* (Everhard, 2019) (Stone, 2019): A citizen developer is a *user* usually with no particular ICT background who creates applications for consumption by others. More and more, *low-code* development and runtime environments sufficiently applicable for citizen development are employed; Microsoft's Office/Dynamics365 with PowerApps, Flow, etc. is one example, others are Mendix or Outsystems (Iijima & others, 2019) (Richardson & Rymer, 2016). These are *sanctioned* and *supported* by the organization's central IT (and often also used by themselves, to accelerate their own development speed); citizen development should not be misunderstood as an unguided 'shadow IT'. Particular attention must be paid to the topics of security and training.

By enabling and training interested campus citizens to take over parts of the university's digitalization efforts, they are just becoming citizen developers. In addition to a low-code environment they use the above-mentioned API, RESTful and conditioned for end-user usage. A proof-of-concept with selected campus citizen developers employing PowerApps and accessing an API prototype that provides first data via oauth2 is currently underway, the evaluation of results will be completed by 05/2020.

4. REFERENCES

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5. AUTHORS' BIOGRAPHIES

Christoph Baumgarten studied computer science at the Technical University of Braunschweig, Germany, at Master's level (1995), and gained research experience as a visiting scholar at the Arizona State University as well as ETH in Zurich, Switzerland. In 1999 he received a PhD at the Technical University of Dresden, Germany, within a state-funded Research Training Group. His professional experience comprises various IT management positions, including CIO of the University of St. Gallen, Switzerland (2009-2017), and Head Capability Development AIM (Aeronautical Information Management) at Skyguide Swiss Air Navigation Services (2003-2009). Since mid-2017 Christoph Baumgarten is working as a lecturer in business informatics at the FHS St. Gallen.

Alex Simeon studied mechanical engineering at the HSR in Rapperswil, Switzerland, from 1982-85. He then worked as an assistant and from 1987-90 as a systems engineer in the mechanical engineering department. In 1991 he moved to Sulzer Ltd., where he held management positions in various departments and was responsible for the introduction of a wide range of IT systems. From 2000-2003 he was head of CAx/PDM systems at Sulzer's IT department. Alex Simeon was elected Professor of Mechanical Engineering and Head of IPEK (Institute for Product Design, Development and Construction) at HSR in 2003. Since September 2011, he has been Vice-Rector for Applied Research and Development and a member of the HSR's university management. In September 2020 he will take up his new position as Chief of Staff of the OST – Eastern Switzerland University of Applied Sciences.

Michael C. Wilhelm studied mechanical engineering at the Technical University of Karlsruhe, today KIT. From 1983 to 1988 he worked at the Institute of Production Science. His work focused on IT-Systems and methods for development and production, with focus on CAx-Systems for design and simulation, CAM (manufacturing) and CAQ (Quality)-Systems. After completing his doctorate, he worked as a consultant for automotive and suppliers as well as for mechanical engineering companies. In 1997 he moved to the University of Applied Sciences in Karlsruhe where he give lectures for Quality Management and Production. Since 2015 he is member of the university management and responsible for teaching at the Interstate University NTB in Buchs, Switzerland.