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## LIFELONG LEARNING: PRINCIPLES FOR DESIGNING UNIVERSITY EDUCATION

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### ABSTRACT

Aim/Purpose	Due to the rapid development of digital technology, create knowledge to support the development of education for lifelong learning.
Background	There is a lack of normative and prescriptive support that can guide the development of education concerning lifelong learning.
Methodology	Design science research, interviews, grounded theory and root-cause analysis.
Contribution	Contribution to practice: A master program in Information Systems that supports lifelong learning. Contribution to theory: Advancements on design knowledge that can guide the development of education programs concerning rapid advancements in digital technology.
Findings	Five design principles: consider rapid development of digital technology, balance time-consuming bureaucratic procedures with companies' demands for speedy access to modern courses, simplify procedures for students applying with work experience qualifications, implement plans for competence development of teachers, and base courses on rigour and relevance.
Recommendations for Practitioners	Companies could enter the whole education program or select interesting courses or course modules.
Recommendations for Researchers	The design principles should be considered when research on guidance concerning lifelong learning for adult learners is conducted.
Impact on Society	Lifelong learning enhances social inclusion, active citizenship and personal development, as well as competitiveness and employability.
Future Research	Further validation of the design principles in order to create knowledge that can support the development of education for lifelong learning.
Keywords	lifelong learning, design principles, development of study programs, academy-industry collaboration

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## INTRODUCTION

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The concept of lifelong learning has attracted a lot of interest for several years (Agudo-Peregrina et al., 2014; Dascalu et al., 2016; Dunlap & Lowenthal, 2013). Lifelong learning is an ongoing, voluntary and self-motivated acquirement of knowledge for either private or professional purposes (Clyth et al., 2000). It is meaningful from various perspectives: individual (e.g., employability, social inclusion), organisational (e.g., competitiveness, attractive employer), and societal (e.g., active and knowledgeable citizens) (European Commission, 2006). Lifelong learning has become a success factor in shaping knowledge societies with the potential of creating new scientific and technological knowledge.

On meeting the growing demand for lifelong learning, universities face several challenges. One overarching challenge is that the curriculum is seldom designed for lifelong learning. Traditionally, universities focus on bachelor and master degrees targeting younger students at an early stage of their education. Already in 1997, the UNESCO Institute for Education announced that universities have to open their doors to adult learners and that they have to adapt their programs and learning conditions to meet the needs of adult learners. Yang et al. (2015) add that universities need to redefine their commission in order to support lifelong learning and that there it is beyond doubt that universities have a vital role to play in this respect. In general, it seems that the universities have handed over much of the responsibility for lifelong learning to private training firms. Education offered by private training firms is often of high relevance to individuals with work-life experience but may lack theoretical perspectives and methodological rigour. It is our conviction that universities can function as attractive education partners for the founding of modern curriculum for lifelong learning.

There is a growing interest in lifelong learning among companies and individuals in the IT sector, due to the rapid advancements in digital technology (Chitiba, 2012). Inoue-Smith (2017, p.17) states that “Because of the increasingly rapid pace of technological advancement higher education institutions face a strategic imperative to broaden access to lifelong learning ...”. This means that up-to-date knowledge regarding digital technology has become a powerful asset. Knowledge is a necessary requirement for companies to survive in a more knowledge-intensive society, embracing an increasing number of digital components. Concepts such as data-driven innovation, artificial intelligence, machine learning and automation have become key components in technological advancements. The rapid advancement taking place has created an increasing desire to study digital technology at universities (e.g., Yang et al., 2015; Swedish Council for Higher Education, 2020).

One specific challenge is how to manage the management of rapid development of new digital technology in relation to the cumbersome bureaucratic procedures at several universities (Chitiba, 2012). The implementation of a modern education program that includes studies of the latest digital technology can take up to three years. This means that an education program might already be outdated before it has been launched. On the other hand, following bureaucratic procedures is necessary to ensure that legal processes and regulatory documents are followed. There seems to be a conflict between offering education that is up to date and the necessity of following bureaucratic procedures.

Another challenge is how to master the management of continuous competence development aimed for teachers at universities (e.g., Day, 2002; Scales & Kelly, 2012). Usually, when we discuss lifelong learning, we are talking about lifelong learning for students, and we tend to forget competence development intended for the teachers. This situation corresponds to the idiom “Cobblers’ children are worst shod” which means that universities are working hard to please the students’ needs but may be neglecting their own needs. The universities’ most important assets are the teachers, since without knowledgeable teachers, the universities cannot fulfil their commitments. Almost every university offers competence development for their staff. However, this competence development is usually about pedagogical issues related to teaching and learning and not about the core subject itself. Yang et al. (2015) state that the role of Higher Education Institutions in promoting lifelong learning is not limited to what they offer students; they should also make a vital contribution through initial and continuous training of teachers, and research into lifelong learning.

Moreover, another challenge relates to the inclusion of companies in the development process concerning new education. Dealtry (2009, p.157) state that there is a need for a novel dynamic and creative way of thinking and of process innovation that will shatter "... the mould on traditional academic process thinking". Strategically including companies in the development process is a way of ensuring that the education will be relevant to the companies (e.g., Agerbæk & Houmøller, 2018). This, however, does not mean neglecting academic perspectives. Instead, a joint academy-company effort will strengthen the possibilities of collecting empirical evidence for the development of relevant course content and to apply scientific approaches to the studies. The challenge consists in managing the collaboration between the academy and companies, successfully.

Lifelong learning means that universities need to target a variety of age groups. Traditionally, universities are focusing on recruitment of students aged 18-25 years. Lifelong learning means that universities have to expand their recruitment strategies so as to include other age groups as well. O'Grady (2013) states that lifelong learning focuses on adults who are returning to organised learning. To ensure that new target groups can be identified, universities need to analyse whether existing marketing channels can be reused or if new ones need to be created.

Together, these challenges form an integrated whole that universities need to pay attention to in order to offer attractive types of education that support lifelong learning and are founded on real competence needs. Based on our literature review, we have identified a vast number of articles discussing lifelong learning from different aspects such as conceptual and phenomenological discussions (Aspin & Chapman, 2000), motivation for lifelong learning (Collins, 2009), societal impact (Jarvis, 2007), self-direction (Shum, 2009) and social capital (Field, 2005). Our conclusion is that there is a lack of principles for how to design education that supports lifelong learning with regard to the challenges described above.

The purpose of this study was to create design knowledge concerning the development of an education program supporting lifelong learning by identifying and analysing challenges and b) based on the challenges, suggesting design principles that can guide the development of education programs. This means that the theoretical contribution consists of design knowledge that is often presented in terms of design principles which can be reused in new situations (Chandra et al., 2015; Cronholm & Göbel, 2019). Baskerville and Pries-Heje (2010) add that design principles constitute the basis for action. The design principles are generalised, which means that they should be able to guide the development of other education programs facing similar challenges. Our study was conducted as design science research (DSR), a research paradigm which has gained a lot of interest within the discipline of Information Systems (IS) (e.g., Baskerville, 2018; Gregor & Hevner, 2013; Vaishnavi & Kuechler, 2015). A common objective of DSR is to develop and theorise about artefacts such as models, methods or digital tools. Moreover, DSR is often carried out as joint study including both researchers and practitioner, which means that results are developed and evaluated in close collaboration with practitioners (Sein et al., 2011; Cronholm & Göbel, 2019). In DSR, there is a broad consensus that research must respond to a dual mission: "... make theoretical contributions and assist in solving the current and anticipated problems of practitioners" (Sein et al., 2011, p.38). The knowledge created in research project is based on theoretical insights, and experiences from an education project concerning the development of a master program, which involved seven academics and 20 companies. The artefact developed consisted of a proposal concerning a curriculum (including courses) for a master program in Information Systems. The master program is entitled "Data-Driven Service Innovation", and is intended as the contribution to practice.

Our study is concerned with formal lifelong learning. This means that the design principles suggested address a situation where learning can be assessed. However, we recognise that lifelong learning can also be non-formal or informal. This means that learning can be based on life experience and also on activities that have not been designated as learning (e.g., Colardyn & Bjornavold, 2004; Marsick & Watkins, 2001). The following section describes the concept of lifelong learning. After that, a literature review dealing with support for the development of education programs concerning lifelong

learning will be introduced. Then, the research method will be presented, followed by a description of the project characteristics. After that, the identified challenges and the suggested design principles will be elaborated on. Next, a discussion concerning the findings will be presented. Finally, this will lead to conclusions being drawn.

## LIFELONG LEARNING

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The concept of lifelong learning has been discussed for a long time. Vidmar (2014) states that the concept was discussed already in ancient Greece in terms of "... the personal, moral development of the individual ... and as preparation for a career or practical work" (p.93). Furthermore, lifelong learning involves increasing employability, which implies professional development and active citizenship (Dede, 2020; Vidmar, 2014). Illeris (2003, p.13) states that lifelong learning "... has become more integrated into the labour market and employment policies of governments and international organisations such as the EU and OECD". Chitiba (2012, p.1944) reports that lifelong learning "... offers the prospect of a radical new approach especially for the higher educational process focused on the opening up traditional universities for those who want to learn lifelong". There are several definitions of lifelong learning with similar meanings, and there are also several synonyms. The Commission of the European Communities defines lifelong learning as "all learning activity taken throughout life" (Committee of the Regions, 2002, p.9). Chitiba (2013, p.1945) defines lifelong learning as the continuous development and improvement of the knowledge and skills needed for employment and personal fulfilment through formal and informal learning opportunities. Moreover, lifelong learning can exist at all times and in all places.

The concept of lifelong learning shares meanings with other similar concepts such as adult education, training, continuing education, and permanent education. Filipe et al. (2014) prefer to use the concept of continuing professional development. They expand the definition of lifelong learning into including, not only personal learning related to the core business, but also in interpersonal competencies such as team building, teaching and communication. Moreover, they state that continued professional development should be integrated into the framework of professional life. Watson (2003) states that lifelong learning is the lifelong, voluntary, and self-motivated search that can improve personal or professional knowledge. Furthermore, she emphasises that lifelong learning enhances social inclusion, active citizenship and personal development as well as competitiveness and employability. Chitiba (2013) states the lifelong is a process that is pursued throughout life and is based on the following pillars:

- Learning to know: mastering learning tools rather than the acquisition of structured knowledge.
- Learning to do: equipping people for the types of work needed now and, in the future, including innovation and adaptation of learning to future work environments.
- Learning to live together, and with others: peacefully resolving conflict, discovering other people and their cultures, fostering community capability, individual competence and capacity, economic resilience, and social inclusion.
- Learning to be: education contributing to a person's complete development of mind and body, intelligence, sensitivity, aesthetic appreciation and spirituality.

As mentioned above, this study is interested in formal lifelong learning that is offered by universities. Formal lifelong learning brings structure to learning and provides a systematic view because the point of departure is to understand the needs of the learner (Chitiba, 2013). Colardyn and Bjornavold (2004) add that formal learning occurs within an organised and structured context (formal education, in-company training), and that is designed as learning. It may lead to formal recognition (diplomas, certificates). Formal learning is intentional from the learner's perspective. Therefore, lifelong learning means a shift of attention from knowledge providers such as universities and private training firms, to the recipients on the demand side.

Finally, Chitiba (2013) states the main drive for lifelong learning is the need to "... up-skill the population to meet the challenge of the information and knowledge society" (p.1946). Furthermore, she asserts that the most significant barriers are: a) academic staff non-acceptance and non-engagement in this process and b) lack of funds. This means that successful implementation of lifelong learning at universities requires "... not only adoption by enthusiastic innovators but also institutional structures to support the sustainability and mainstreaming of lifelong learning initiatives" (p.1946).

## LITERATURE REVIEW

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In order to identify relevant articles about design principles that could support lifelong learning concerning education programs within the area of digital technology, we needed to formulate an appropriate search strategy. We decided to analyse journals published in the Scopus database, since this is the largest abstract and citation database of peer-reviewed literature, including the fields of technology, medicine, social sciences, and arts and humanities. To find relevant articles, we used the search criteria: recommendations, principles, guidelines, guides, strategies, advice, education program and lifelong learning, which were combined in the following search string: TITLE-ABS KEY ((*recommendations* OR *principles* OR *guidelines* OR *guides* OR *strategies* OR *advice*) AND "*lifelong learning*" AND "*education program*") AND (LIMIT-TO (PUBSTAGE, "final")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j")). In total, we identified 59 articles that fulfilled the search criteria. We then read the abstracts of every article to decide their relevance to our study. Out of these 59 articles, 11 articles provided support for the design of lifelong learning in education programs. We do not claim that our literature review was exhaustive since we limited our search to journals in the Scopus database. In addition, we applied backward reference searching by reviewing relevant papers cited in the identified articles in the leading IS Journals (i.e., snowball sampling) (e.g., Naderifar et al., (2017), and articles suggested by competent reviewers of this paper.

The purpose of the study conducted by Holland (2019) is to suggest effective principles concerning informal online learning. Holland has analysed 22 articles to identify what is known about adults informally learning online. The analysis identified 21 principles formulated at a highly general level. Some examples are that learning objects should be search friendly, provide abundant resources, and that learners should be interested in the topic. All the 21 identified principles were synthesised into two effective principles concerning informal online learning, which read: (a) interaction opportunities support knowledge construction and learner empowerment; and (b) segmented, titled, and tagged learning objects facilitate personalised learning. Unfortunately, the study provides no empirical evidence concerning the synthesised principles. One important conclusion is that, in many cases, effectively employing these principles will require collaboration among relevant stakeholders.

Bass et al. (2017) present a structured model of holistic reflection. The purpose of this model is to provide an educational tool to assist midwifery students when building a reflective practice. The development of the model is guided by several principles identified in the literature. Several of these principles highlight the importance of reflexivity, critical thinking and holistic approaches. The model consists of six integrated phases: self-awareness, description, reflection, influences, evaluation and learning. So far, the model has not been evaluated in practice.

Bridgstock (2013) states that the practice of entrepreneurship in the arts is significantly different from the practice of entrepreneurship in business. Consequently, entrepreneurship curricula in arts cannot be imported from business schools. Moreover, Bridgstock (2013) suggests three iterative phases during which entrepreneurial artist identities can be developed through higher education programs. These are: career identity building, identification of value-congruent opportunities for enterprise and experiential project-based work. The study is conducted as a literature study. One conclusion is that the educational context plays an important part in the design of lifelong learning. In this case, it is emphasised that entrepreneurship is not a subtopic within a business-related curriculum, but is a complex set of qualities, beliefs, attitudes and skills that underpins all areas of working life.

The purpose of the study conducted by Dusenko et al. (2016) has been to examine how innovations are used within education. More specifically, the authors have investigated the use of e-Learning as Internet and multimedia-based instruction at universities and its role in university students' acquisition and reinforcement of knowledge. One conclusion is that e-Learning is unlikely to replace traditional education completely. It will create new teaching and learning opportunities and additional conditions for personal development, advanced training and lifelong learning. This conclusion is based on a theoretical study.

Dzakira et al. (2012) have conducted a case study to analyse factors contributing to successful blended learning from a student perspective. The case study includes a business communication course involving 16 students. The identified contributing factors for the attainment of successful blended learning are an innovative shift from a presentational format to active learning; access to personalised learning, resources and experts; flexibility and accommodation for learners and teachers of diverse backgrounds; interaction and sense of community; and cost-effectiveness.

Filipe et al. (2014) have analysed continued professional development (CPD) regarding medical competence. The purpose of their paper is to review best practices to promote effective CPD. Moreover, Filipe et al. (2014) state that an effective CPD scheme should contain three quality components: a) professional improvement that ensures personal learning related to the populations' changing needs and developing healthcare service, b) effective learning interventions should be designed upon clear, attainable, and measurable learning outcomes and offer relevant and evidence-based content to the physician's clinical practice, and c) it must be accountable, transparent, amenable to regulation, and useful for assuring quality in the process of re-licensure.

The article presented by Forman et al. (2002) suggests that e-learning contributes to enhanced learning in education programs. The authors argue for a shift from teaching to learning that focuses more on the learner than on the institution. Forman et al. (2002, p.82) state that "Institutions, equally, have to change their mental set and move away from traditional learning modes to more innovative, and participative ones". The article concludes that only learners who have acquired skills for learning how to learn will benefit from e-learning. Moreover, Forman et al. (2002) conclude that successful learners are more likely to have the following abilities: a) organisational skills to manage academic as well as other social responsibilities, b) sufficient independence for working alone, and c) involvement in lifelong learning and knowledge to identify and quantify the learning required for necessary assessment.

Omrani et al. (2012) report from a study regarding the lifelong learning of physicians, within which a comparison was conducted between an e-learning method and a traditional learning method. One conclusion is that instructional and motivational design should be used for more advanced electronic continuing medical education programs.

Jones et al. (2017) have studied a postgraduate program regarding surgical training. They state that once surgeons are in practice, they risk experiencing a performance plateau. Moreover, they state that existing education materials have not been structured into longitudinal pathways for lifelong learning. The purpose of their study was to develop a master program on the subject of lifelong learning. The development of the master program was based on discussions with companies, and a survey sent out to a branch organisation. The authors conclude that the developed master program embraces the concept of lifelong learning, and that its curriculum evolves from being organised according to basic principles into harbouring a more complex content. Jones et al. (2017, p.3061) explicitly state that "lifelong learning should be a better way to teach and learn".

Van der Vleuten et al. (2010) present lessons learnt from experiences regarding an assessment of professional competence, and state that these lessons can also be read as general principles of assessment programs. Some interesting lessons learnt are: competence is specific, not generic; objectivity is not the same as reliability; assessment promotes learning; validity lies in the users of the instruments, more than in the instruments; and formative and summative assessment are typically combined.

Yamashita et al. (2015) have studied motivation for learning in relation to age among adults. They state that mature adults generally have a lower motivation for learning than young adults. In their study, they have identified factors that will promote learning among the more mature. The factors have been categorised as either personal or environmental factors. The identified personal factors are age, gender, race, number of household members, income, years of education, employment, religious affiliation, social life with friends, and self-rated health. The identified environmental factors are reasons for the program participation, the number of courses taken, and the travel time required when taking a program.

Shum (2009) presents a model entitled: “A Learning Model Emphasizing Experience and Practice”, which aims to empower the process of lifelong learning. The model includes some specific actions: formation of student unions, promoting the participation of adult students in classroom teaching, and learning for capacity building and empowerment. One suggested guideline is “Participation in Curriculum Development”. This guideline emphasises the importance of involving learners in making various decisions relating to curriculum development. The authors have collected empirical evidence by conducting a survey and interviews. Shum (2009, p24) concludes that “... empowerment of the elderly in the learning process also enhances their participation at both the courses and activities organization level as well as the classroom teaching and learning level”.

Buhl and Andreasen (2018) have analysed massive open online courses (MOOCs). They state that the MOOC phenomenon has created optimism as well as scepticism. The optimism is based on the potential due to the “massiveness” and “openness” which can provide expanded space in terms of self-directed learning for more people. However, self-directed learning “... may lead to misunderstandings of the ways in which “massiveness” and “openness” work for users” (p.160). One important conclusion is that MOOCs may not be the ultimate solution. The authors emphasise that it is vital to analyse the implications of MOOC implementations further.

Dunlap and Lowenthal (2013) have studied how postsecondary educators can use the Web 2.0 technologies (e.g., blogging, social networking, document co-creation, and resource sharing) to create learning opportunities that can support students when developing the skills needed for lifelong learning. The authors state that these technologies have the potential to support lifelong learning endeavours. The article concludes that a) it is time to evaluate the efficacy these technologies, and b) there is need for experimenting with different ways of using these tools to meet educational goals with varying audiences of learning.

Wilson et al. (2007) state that current education systems cannot really support lifelong learning. The purpose of their article is to suggest an alternative system that emphasizes symmetric connections with a range of services both in formal and informal learning. Moreover, they argue that virtual learning environments (VLEs) offer the dominant design alternatives in educational technology today. The authors are challenging this dominance and claim that models concerning personal learning environment “... will develop in sophistication, making the VLE a less attractive option, particularly as we move into a world of lifelong, lifewide, informal and work-based learning” (p.37).

Koper (2004) has analysed requirements for the development of a learner-centred and learner-controlled approach concerning distributed lifelong learning in Europe. The article presents a few challenges, and actions that could be taken, to address the challenges. Koper (2004) states that a) European institutes should set up serious collaborations with other national and international institutes to establish learning networks for lifelong learning, b) the management style should allow some sort of openness and self-organisation in the collaboration between the institutes, and c) the most significant challenge from a pedagogical perspective is to implement a learner-centred approach.

Talmage et al. (2018, p.109) state that “The literature regarding lifelong learning is robust, while the literature on lifelong learning institutions, centers, and programs remain under-researched in comparison”. The authors adopt an institutional perspective in order to elaborate on directions (themes) that post-secondary education should consider with respect to lifelong learning. One purpose of the

themes and directions is to guide future research and practice. The directions are: What are effective lifelong learning strategies to help older adults reach their highest potential(s) for physical and cognitive health?, How does lifelong learning transform the lives of older adults?, How might lifelong learning institutes continue to serve their current populations while also working to reach and serve other older adult populations?, How do we design and structure lifelong learning programs and institutes that will sustain or thrive for the long-term and have long-term impact for lifelong learners?, How can lifelong learning institutes effectively utilize current and emergent technologies for learning in their programs?, How might lifelong learning institutes effectively encourage creative expression?, How must lifelong learning institutes adapt to effectively reach older adults, especially diverse populations not currently engaged with lifelong learning?, What are effective strategies and pedagogies for older adults?, What is the place for and benefits of intergenerational learning in lifelong learning programs?, What are effective ways to evaluate lifelong learning institutes and their programs/programming?, What role does community-building play in lifelong learning?, and Which roles do community partnerships play in lifelong learning?

Finally, Zitter (2010), has applied a design perspective on learning. The research question reads: “how we can design and improve project-based, ICT-supported learning environments in higher professional education?” (p.18). The author has used a specific logic called CIMO (context, intervention, mechanisms, outcomes) (Denyer et al., 2008). The purpose of CIMO is to support the creation of a problem structure and the formulation of a solution. Zitter (2010) concludes that CIMO-logic helped to structure the scientific knowledge generated in a way that makes it applicable in practice. Another conclusion is that “... the selected professional objects and technology played across the dimensions of acquisition-participation and simulation-reality, throughout the project-based, technology enhanced learning environment” (p.101).

In summary, all the reviewed articles provided insights that are valuable to our study. However, some remarks need to be mentioned:

- The first remark is that none of the studies reviewed have specifically developed support for lifelong learning concerning education programs that have taken into consideration the rapid development of digital technology. We recognise that lifelong learning is essential to all fields of education. However, we concede that due to the rapid development of digital technology, education programs in this field require continuous adjustments concerning lifelong learning.
- The second remark is that most of the reviewed articles lack empirical evidence based on primary data (one exception is Shum et al. (2009)). This means that the suggested models, principles or strategies have not been evaluated in practice.
- The third remark is that several of the articles discuss lifelong learning as an outcome of participation in courses, and not as a collaborative effort concerning *design, participation and evaluation* of courses.
- The fourth remark is that several of the articles are focused on lifelong learning concerning individuals, and not on lifelong learning for organisations.
- The fifth remark is that the support (strategies, recommendations, guidelines, advice) for the design of lifelong learning suggested in the reviewed articles are normative and not prescriptive. Gregor (2006) states that support informing about *what to do* is normative, while support informing about *how to do* something is prescriptive.
- The sixth remark is that the articles that included interaction with stakeholders outside the university have mentioned the collaboration aspect as a positive factor.

## THE RESEARCH METHOD

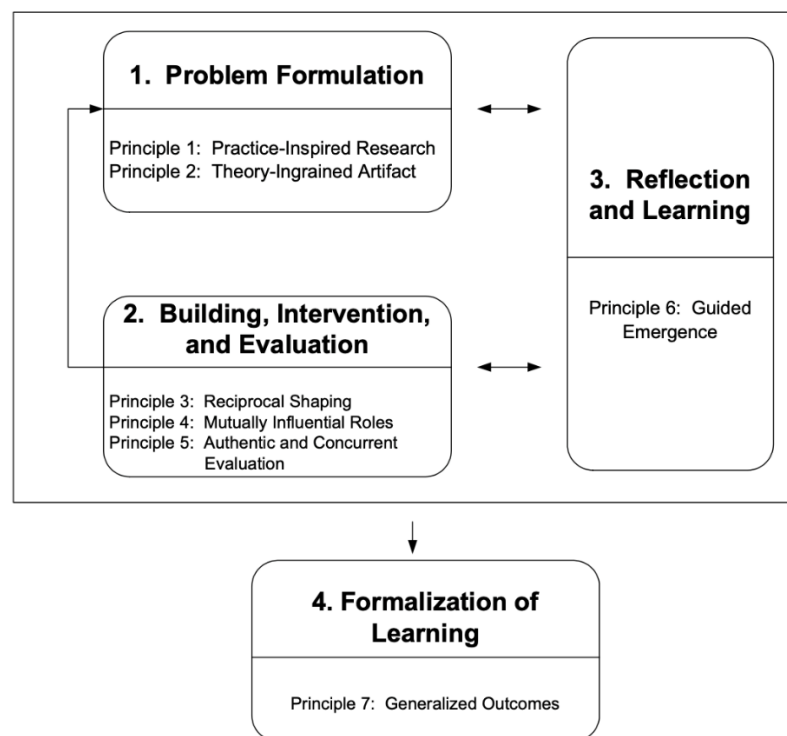
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As mentioned in the “Introduction”, this study was conducted as design science research (DSR). The specific DSR method we have used is Action Design Research (ADR) (Sein et al., 2011). There are several reasons for choosing the ADR method. One reason is that an ADR project should include



both researchers and practitioners to embrace theoretical, technical, and practical perspectives (Sein et al., 2011). This means that the ADR method caters for both researchers' and practitioners' interests. Another reason is that the ADR method is the most-cited DSR method, thereby increasing the likelihood of our findings attracting some interest. A third reason is that the ADR method explicitly encourage an ADR project to develop design principles.

The ADR method consists of four stages which are: Problem Formulation (identifying and conceptualising a research opportunity based on existing theories and technologies); Building, Intervention and Evaluation (realising the design of the artefact and articulating the design principles); Reflection and Learning (moves conceptually from building a solution for a particular instance to applying that learning to a broader class of problems); and Formalising of Learning (the situated learning from an ADR project should be further developed into general solution concepts) (see Sein et al., 2011, for a detailed description). Each stage includes principles that guide the method user (see Figure 1).



**Figure 1: The ADR method: Stages and Principles** (Sein et al., 2011)

In the first ADR stage, Problem Formulation, relevant literature was reviewed to learn what is known about existing challenges and support concerning the design of lifelong learning in education programs for the study of digital technology. Interviews were conducted with the participating companies to identify their competence need and the flexible education forms they preferred. In total, were 50 interviews conducted with managers and IT consultants.

The purpose of the second ADR stage, Building, Intervention and Evaluation, was to A) Propose education in terms of courses or course modules concerning data-driven service innovation. We analysed the interviews with the purpose of categorising similar competence needs by using the Grounded Theory Method (GTM); the analysis included the phases of open coding, axial coding and selective coding (Strauss & Corbin, 1998). Urquhart et al. (2010) state that “Grounded theory is a

qualitative research method that seeks to develop theory that is grounded in data systematically gathered and analysed” (p.357) and that it “... has proved to be extremely useful in developing context-based, process-oriented descriptions and explanations of information systems phenomena” (p.358);

The character of the evaluation process was naturalistic, which is always empirical and encompasses all the complexities of social practice in real organisations (Venable et al., 2016). To ensure the relevance of the education, researchers and practitioners from the participating companies jointly compared the suggested courses that would correspond to the companies’ competence needs. The relevance and quality of the courses were also jointly evaluated after the courses had been completed. The evaluation was conducted through interviews with the teachers and practitioners who participated in the courses. The practitioners also participated in a survey of the quality of the course. The results from the evaluation created a base for a redesigning of the courses. This meant that the evaluation involved real users, real problems and real systems, which representing three critical ingredients in empirical evaluation (Sun & Kantor, 2006). To summaries, the design and evaluation of the courses were a) guided by both theoretical insights from the literature review and empirical evidence and b) conducted in close collaboration with the companies. In this way, we could ensure that the suggested courses were relevant to the companies. Zimmermann et al. (2007, p.562) state that collaboration is incredibly valuable when organisations "... share certain characteristics, interact with one another or have established certain relations between each other." In the ADR project, the organisations shared an interest in developing an education program supporting lifelong learning based on existing competence needs.

During the third stage, Reflection and Learning, we identified and analysed challenges experienced in the ADR project which were related to the design and evaluation of the courses. Furthermore, we also analysed possible relationships between the challenges. The purpose of this exercise was to identify possible reasons for the challenges. We used root-cause analysis, which is a systematic tool for detecting causes and effects (Rooney & Heuvel, 2004). Moreover, at this stage, the design principles emerged. Baskerville and Pries-Heje (2010) state that design principles are prescriptive in nature and constitute the basis for action. Cronholm and Göbel (2018) add that one of the purposes of design principles is to support designers in their tasks by informing them what to do and how to do it. The formulation of design principles and courses were developed alternately and in close interaction. The formulation of the design principles was based on how the courses were designed and evaluated in the ADR project. At the same time, the courses were iteratively shaped and reshaped by the emerging design principles. This means that the iterative development of the design principles and the development of the courses mutually supported each other. The objective of the fourth stage, Formalising of Learning, is that the situated learning from an ADR project should be further developed into a general solution. This meant that we generalised the emergent design principles for them to be reusable in new situations. To ensure that the design principles were consistently formulated, we have used the formula suggested by Walls et al. (1992): “If you want to achieve goal X, then make Y happen”.

## **PROJECT CHARACTERISTICS**

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The ADR project was carried out through participation with seven academics from the university and from twenty companies. The academics involved worked both as researchers and as teachers. Four of them belong to the discipline of information systems, two belongs to the discipline of teaching and learning, and one to the discipline of business and administration. This meant that the project environment included an interdisciplinary composition of academics. The selection of academics was based on the project’s need for specific competences. As mentioned in the “Introduction”, the master program is entitled “Data-Driven Service Innovation”. The “data-driven” competence was held by academics from the discipline of information systems, while the academics from the discipline of business and administration were knowledgeable regarding “service”. The reason for also engaging academics from the discipline of teaching and learning was to add competences regarding pedagogies related to distance learning.

A majority of the participating companies were IT companies, and some of the companies have other core business than IT such as car production, retail or telecom. The participating representatives from the companies hold positions such as: IT Quality Managers, Head of Architecture and Solutions, IT consultants, Manager of Consumer Services, Business Manager, CEO, IT Process Framework Manager, and Manager Consumer Sales. The mix of academics and participating companies meant that perspectives from different disciplines and practices were applied to the development of the master program.

The ADR project can be characterised as highly collaborative since there was frequent interaction between academics and practitioners. The interactions consisted of: a) Arrangements of dyadic academic-practitioner meetings with all the participating companies. One dyadic meeting meant that 1-2 academics interacted with one organisation (2-3 practitioners) at a time to identify competence needs or discuss course development, and b) Joint workshops that involved all the academics and all the companies. Due to this close collaboration between academics and practitioners, the traditional roles of academics and practitioners to some extent started to overlap. The practitioners acted as “reflective practitioners” (Schön, 1983) and the academics as “practice-inspired academics” (Goldkuhl et al., 2017). This expansion of the traditional roles of the academics and practitioners facilitated collaboration and mutual learning.

One consequence of the dyadic academic-practitioner meetings was that they resulted in mutual learning among academics and practitioners. The academics learned about the practitioners’ competence need and the practitioners learned about the university as a partner for knowledge development. However, we realised that the learning from the dyadic meetings was highly contextual. We realised that we could use the workshops, that involved all the companies and academics, as a tool for generalisation. A consequence of the workshops was that they enriched the course design. The involvement of all the companies in the workshops also meant that they learned from each other by sharing business knowledge.

The development of the courses was based on real competence needs expressed by the practitioners. The courses were jointly developed, several of the practitioners acted as guest teachers during the realisation of the courses, and both teachers and practitioners participated in the evaluation of the courses. The ADR project included nine work packages (WP) that were carried for four years. The involved work packages were: WP 1 Identification of competence needs and resources, WP 2 Engagement of the Admission Office and the Communications Office, WP 3 Environmental scanning, WP 4 Course development, WP 5 Realisation of courses, WP 6 Course evaluation, WP 7 Reflection and learning, WP8 Competence development of teachers, and WP 9 Implementation of the master program in the regular course offerings. In total, ten courses were developed. The courses are presented briefly at the end of the section “Findings”.

## FINDINGS

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The findings are structured according to the identified challenges in the ADR project concerning life-long learning regarding the development of an education program. The challenges are based on empirical experiences identified in this project. The challenges identified are: lack of strategy for how to handle rapid development of digital technology, time-consuming internal bureaucratic processes, lack of knowledge about validation of prior learning concerning work experience, lack of management of continuous competence development of teachers and lack of knowledge regarding how to ensure practical relevance and retain scientific rigour. For each subsection below, we begin by describing the challenges and then how they have been dealt with. To illustrate the companies’ views on the challenges, references to several quotes will be made. After presenting the challenges, we will supply an analysis of relationships between them to clarify causes and effects.

In the final subsection, we will present the design principles based on experiences of how the challenges were handled within the ADR project. The fact that the description of the challenges has been

granted more attention than the design principles should not be understood as an imbalance. To gain a better understanding of the foundation of the development of the design principles, we realised the necessity of being transparent and of describing the challenges in detail. Therefore, the challenges and design principles are to be regarded as an integrated whole, since the design principles reflect the challenges. The relationship between the challenges (problem) and the design principles (solution) is adequately worded by Reid (1986): "a perfect formulation of the problem is already half the solution". Moreover, to enhance the reusability of the design principles, it is recommendable to offer rich contextual descriptions of implementations based on the principles (e.g., Chandra Kruse & Seidel, 2017; Lukyanenko et al., 2017).

### *IDENTIFIED CHALLENGES*

#### **Lack of strategy for how to handle rapid development of digital technology**

Universities want to be attractive to students. Hence, it is crucial to offer a rich learning environment including courses that appeal to a broad spectrum of students. From the perspective of lifelong learning, it is therefore essential for universities to keep up with the rapid development of modern digital technology. This means that universities continuously need to revise and improve education programs.

In the ADR project, we identified a lack of support (e.g., strategies, processes, routines, guidelines) at the university regarding how to keep up with the rapid development of new technology. Updates of education programs were usually carried out on an ad-hoc basis and often based on program managers' individual preferences. The lack of strategy meant that there were no clear goals or directions for the development of the education program. It also meant that the direction chosen for the updates of the education program was not always based on the companies' competence needs. Based on a comparison of the current situation at the university and the result of the interviews with the companies, the project group learned that the university needs a strategy that clarifies what should be done for whom, and how value can be offered to the companies.

Furthermore, the project group learned that a strategy includes regularly market analyses concerning: a) the companies' need of competence development and b) what other actors on the market are offering. A strategy should guide the university to carry out frequent reality checks that ensure that the education programs harmonise with the companies' request for competence development. Hence, a strategic plan could help the university to develop appropriate goals and help involved actors (e.g., program managers, education leaders) to focus on what is essential. Based on the interviews, we have also experienced the importance of collecting competence needs from different roles (e.g., managers, IT consultants), since they can contribute with significant perspectives on managerial/leadership aspects and hands-on knowledge. It is essential to understand that universities, in most countries, exist in competitive contexts. If universities fail to be attractive, the companies will turn to private training firms. Therefore, universities need to map and measure up to the competition.

A strategy should also include guidelines for conducting an environmental scan. In the ADR project, the environmental scan was seen as a useful tool that could help the shaping of goals and strategies. The environmental scan included analyses of: a) education offered regionally, nationally, and internationally by other universities and private training companies, b) the increasingly rapid changes of digital technology, c) research results, and d) possible changes in governmental regulation. Finally, the project group learned that the strategy needs to be formally documented, shared and mutually agreed upon by all involved actors since it affects all levels and positions.

Some quotes from the companies, which are related to the lack of strategy read:

- "The structural transformation is changing rapidly. Companies and individuals need modern tools to keep up with rapid development of new technology".

- “Universities need to be competitive and flexible to retain their position as a market leader of higher education. Otherwise, there will be a disruption concerning how education will be organised and by whom”.

### **Time-consuming internal bureaucratic processes**

The challenge faced, due to time-consuming internal bureaucratic processes, is based on the observation that it can take up to three years to launch a new education program. We also noticed that applications from students often have to be submitted six months before a freestanding course or an education program commences. To learn more about how the processes concerning development and implementation of new education programs or courses are handled, we analysed regulative documents and process descriptions. Not surprisingly, we found that the processes are based on existing laws and statutes. Moreover, these processes are rigorously described, and there is no room for flexibility.

The challenge can be viewed from at least two perspectives, which we call for a university perspective and as well as a company perspective. From the university perspective, it is of most importance to follow the regulations decided on by The Swedish Council for Higher Education and local regulative documents developed at the university. The regulations decided on by The Swedish Council for Higher Education can be found in the Higher Education Act and Higher Education Ordinance. The purpose of these regulations is to govern the operations of higher education institutions in Sweden, and this includes several laws and statutes. The local regulative documents developed at the university are based on the Higher Education Act and Higher Education Ordinance. These local documents prescribe that several internal competent bodies should be involved in different stages of the development and implementation process concerning new education programs. The function of the competent bodies is to recommend approval or rejection of new education programs, and the vice-chancellor’s task is to make the final decision. The analysis of the development and implementation processes regarding new education programs identified that there are significant lead times between some of the activities in the processes.

From the perspective of the companies, the processes of developing and implementing new courses are too time-consuming. Their view is that the university is too inefficient. To be competitive, companies cannot afford to wait for several years. They need competence development here and now. If the university cannot offer an education that satisfies a competence need, when the companies require it, the companies will turn to alternative suppliers such as private training firms. This means that the companies regard existing bureaucratic processes as a barrier for competence development.

Based on the analysis, we can conclude that current processes have not been formulated from a company perspective. Instead, they have been designed from a one-sided internal university perspective, prescribing how to adhere to legal and regulatory issues. This one-sided perspective could hamper lifelong learning, since companies need fast and flexible access to modern courses that are relevant to their competence need. It also seems that the existing processes can be made more efficient and effective without tampering with the regulations.

It is evident that there is a conflict between the university perspective and the company perspective. The university prioritises a process that ensures that laws and statutes are followed as opposed to the companies' need to speedy acquisitions of new knowledge to help them retain their competitiveness. Moreover, the university wants to be an attractive academic institution that offers up-to-date education programs, while at the same time following time-consuming regulatory documents and processes. On the other hand, the companies have a weak understanding of the regulations that the universities are required to follow. They just want access to education and are primarily not bothered with legal aspects. Undoubtedly, there seems to be a lack of understanding between the two perspectives. Based on these observations, we state that the university needs to find a better balance and a pragmatic solution to solve potential conflicts.

Examples of quotes from the companies that are related to this challenge are:

- “Currently, lifelong learning is mostly taking place internally at our company or at private training firms. To contact universities is not in our mindset”.
- “One problem, in this respect, is that the universities’ financial systems are based on full-time equivalents [students that are studying full-time] while the companies prefer short courses comprising 2-3 credits. The current financial systems do not support lifelong learning. There must be better incentives for the universities to organise freestanding courses”.

### **Lack of knowledge about validation of prior learning concerning work experience**

Education programs concerning lifelong learning will attract students of different age groups, which have different formal prior learning. Traditionally, universities in Sweden target students between 18 and 25 years. Lifelong learning means targeting a new age group. This is a group that sometimes lacks formal education, but with substantial work experience. In Sweden, universities can admit students that lack formal degrees. This is only possible if the students have corresponding proof of prior learning in terms of work experience. To promote lifelong learning, the Swedish Minister for Higher Education and Research strongly encourage universities to admit students based on work experience. The Swedish Council for Higher Education (2020) state that the recognition of learning such as work experience “... facilitates and broadens access to higher education for non-traditional students”. The challenge lies in that the analysed university had no established procedures for admitting students to a master program that lack a formal bachelor’ degree. Our environmental scan informed us that the case is the same for several other universities in Sweden.

Moreover, our analysis identified that there is no national recommendation concerning how Swedish universities should evaluate work experience. The Swedish Council for Higher Education refers to the autonomy of the universities, which means that universities can develop its own local procedures. In the ADR project, we found that approximately 20% of the total number of applicants requested validation of work experience. In effect, this meant that the lack of established procedures constituted a massive barrier for lifelong learning. It also meant that ad-hoc procedures were applied to validate prior learning with regard to work experience.

Admitting students on the basis of work experience means establishing a process that allows for prior learning to be recognised and measured, regardless of where it has been acquired. In the ADR project, we developed criteria that were based on a) discussions with the Admission Office at the university, b) an analysis of how other universities have met this challenge and c) discussions with the companies involved. The developed criteria were both general and specific, and they were both quantitative and qualitative. The purpose of developing general criteria was to minimise re-validations if students applied for several similar courses. The purpose of developing specific criteria was to make sure that the student had acquired knowledge enough to be able to follow unique course modules. One example of a quantitative criterion applied was the number of years of work experience. Another example of a qualitative criterion concerned whether the applicant had produced a text which could be regarded as the equivalent of a final thesis. A third criterion was to find out whether the applicant had participated in relevant courses offered by private training firms. The development of the criteria was iteratively evaluated and refined during the project.

One lesson learned from the project was that it was significant to involve the Admission Office from the commencement of the project. From their perspective, the project was regarded as an encouragement to develop general processes for validation of work experience that could be used for other disciplines at the university. We identified that their expertise concerning rules and regulations was necessary to ensure that laws and statutes were followed. Another lesson learned was that the Admission Office did not have the required competence to validate subject-related issues. This meant that expertise from the field of Information Systems also needed to be involved in the validation process.

The procedure applied was that the expertise from the field of Information Systems assessed the admissions by using the criteria mentioned above. After that, the Admission Office decided on whether the applicant was admitted or not.

Finally, we realised that the existing digital tool was not designed for handling applications based on work experience. It was designed to handle applications regarding formal degrees. This meant the application process was not easy and that the applicants experienced several barriers before they could complete their applications. We also realised that some applicants found the application process too difficult, due to the complexity of the digital tool, and therefore never submitted their applications.

A quote from one of the companies regarding the application procedure reads:

- “The system that handles applications is too complex and not user friendly. I do not have a bachelor degree which meant that my application was based on prior learning from 10 years' work experience. The current application system is designed to handle applications concerning formal degrees”.

### **Lack of management of continuous competence development of teachers**

Our literature review uncovered that previous studies concerning lifelong learning have to a large extent targeted student and not university teachers. As mentioned previously, the teachers are the most crucial asset to the universities. The rapid development of digital technology entails that teachers are also in the need of competence development. This demand for competence development must comply with the companies' need for lifelong learning. In the ADR project, we identified that the university allocated 10% of the teachers' time of full service to competence development. However, we found that the allocated 10% often were being spent on interaction with students and/or on course development, and *not on* competence development measures. We also realised that teachers who were engaged in research projects had more opportunities of developing their competence compared to teachers who were mainly involved in undergraduate education.

In addition, we learned that decisions as to how the 10 % should be spent were made by teachers on an individual basis. We also realised that the university sometimes wanted the teachers to spend their allocated time for competence development on other issues that were more relevant for the organisation. At the same time, they did not want to interfere with the teachers' freedom to spend the allocated time as they preferred. We realised that satisfied teachers were an important goal for the university. The different views on competence development meant that there was an inherent conflict between individual and organisational goals. Based on the analysis, we realized that individual and organisational goals needed to be balanced.

The previous paragraphs raised the need for competence development with regard to the introduction of digital advancements connected to the core subject. Another related issue identified is competence development concerning distance learning, which is becoming increasingly popular among both teachers and students. Distance learning requires modern sophisticated digital tools that can support teacher-student communication (e.g., digital platforms, software, video recordings). Undoubtedly, the use of modern digital tools in teaching-learning situations requires technical skills. It also means that traditional pedagogical methods, developed for physical classrooms, need to be modified and aligned to fit the context of distance-learning. Consequently, the use of modern digital tools in a distance-learning context is not just a matter of mastering technology; it is a matter of *mastering the combination of pedagogy and technology*.

The ADR project organised workshops for teachers regularly to meet with the demand for enhanced pedagogical and technological competences. The workshops were usually organised in the following way: A) An initial lecture was given on a specific topic. The lecturers were recruited internally from the university or externally from other universities or companies that had the required competence. B) Modern digital tools were demonstrated by a specific department at the university (The Department of Educational Research and Development). C) Experiences acquired from testing the tools

and adaption of pedagogical methods were shared among teachers. The sharing of experiences meant that, to a greater degree, knowledge individually acquired could be further formalised and institutionalised.

To illustrate the findings presented above, we refer to the following quotes from the companies:

- “Digital education is more accessible than campus-based education. Thus, it provides better opportunities for lifelong learning”.
- “We expect employees at the university to have professional knowledge regarding the necessary tools to carry out digital education”.
- “Universities are running a lot of research projects that are resulting in new knowledge. For us, it is hard to access this knowledge. Teachers need to organise the knowledge in a way that it becomes easily accessible for us. We also think that research funders should require that knowledge created in research projects must be distributed to directly to companies or via education programs”.

### **Lack of knowledge regarding how to ensure practical relevance and retain scientific rigour.**

When developing the courses, the challenge was to ensure practical relevance and at the same time maintain scientific rigour. The analysis of the current situation at the university showed that course development was carried out by program managers and teachers. Usually, the process of course development was based on feedback from students. Also, it was sometimes based on interviews with a handful of companies. This means that the function of the companies was to *provide information*. They were not taking part in stages where the information was analysed or where course was being planned. Typically, these stages were carried out by managers and/or teachers. This meant that there was hardly no collaboration between the university and companies concerning course development. The exclusion of companies in the development process could entail that the practical relevance of courses was lost.

Based on the analysis of the interviews with the companies, practical relevance was a recurring requirement. Practical relevance was considered to be essential since it could improve the quality of the companies’ interactions with customers, and it could also increase competitiveness. In the ADR project, practical relevance referred to that the courses developed contained knowledge that could be applied in practice or put into effect. From the university perspective, maintaining scientific rigour was essential, since it is one of the universities’ most distinctive credentials. In the ADR project, scientific rigour was defined as the application of scientific methods to ensure trustworthy and transparent data collection/generation, data analysis, interpretation and reporting of results.

In order to balance practical relevance and scientific rigour in the ADR project, the companies were included at all stages of the course development: collection of competence needs, analysis of competence needs, planning of courses, and evaluation of course. This meant that the role of the companies changed *from passive information providers to active course designers*. Strategically including companies in the whole development process, safeguarded the relevance of education under development. We also recognised that the involvement of companies resulted in attractive courses on the forefront of the field of Information Systems. From a lifelong learning perspective, the close collaboration with companies helped us to understand their current competence level, which was used as a point of departure for the course design. The incentive for the companies to participate in the project was that they could have an impact on course development, which would correspond to their practical needs, and result in enhanced competencies that would be regarded as practical and useful. Collaborating with companies does not, however, mean neglecting scientific rigour. In all the courses, scientific methods were applied. We could not identify that the requirements for practical relevance contradicted the application of scientific methods. Rather, a joint academy-company effort strengthened the access to real empirical data in the courses, which often is a problem in academic courses. This meant that



both relevance and rigour were in the foreground during interviews with companies, analysis of information, course development, course completion and course evaluation. Some quotes uttered by the companies are:

- "Companies need to be part of the course planning process. To be competitive, we need to make sure that we can get the competence we need".
- "Trust is a prerequisite for successful collaboration".
- "Increased collaboration between universities and companies is the future".
- "Several times universities prefer to collaborate with medium-sized or large companies. This is good, however, equally important is that universities collaborate with small-sized companies. Small-sized companies are often sub-contractors to the larger companies, and that means that they also need to develop their competences and learn new technology. Otherwise, there be a competence gap between larger and smaller companies that will create barriers in the supply chain".
- "The courses satisfied a competence need that existed in our company".

### Relationships between identified challenges

The purpose of this section is to present the root cause of the challenges described above. This is done by using root-cause analysis (RCA). The purpose of RCA is to support the identification of possible relationships, in terms of cause and effects, between the challenges. Rooney & Heuvel (2004) add that RCA contributes to "... identify not only what and how an event occurred, but also why it happened". This means that effective management of the identified challenges requires more than merely putting out fires but also finding a way to prevent them. The identified relationships between the challenges are depicted in Figure 2, showing the identified root cause as a "Lack of strategy for how to handle rapid development of digital technology".

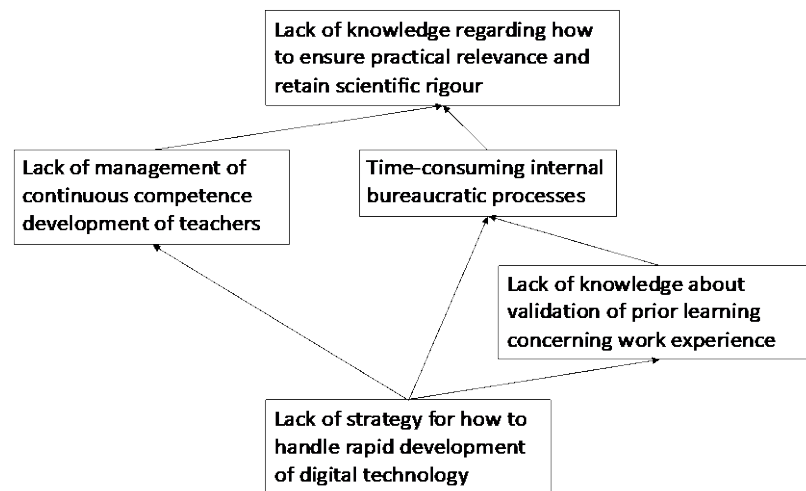


Figure 2: Analysis of causes and effects

### *DESIGN PRINCIPLES*

The formulation of the design principles is based on experience of how the challenges were dealt with in the ADR project. First, the design principles were formulated to address the identified challenges of the specific ADR project. This meant that they were based on learning from one particular project. However, the ADR method strongly emphasises that design principles should be generalised in order to be reusable in other similar situations. As a second step, we generalised the design principles as being applicable in new situations. In this paper, we present these generalised design principles, since they should attract more interest. As mentioned previously, the formulation of the design

principles is based on the formula suggested by Walls et al. (1992): “If you want to achieve goal X, then make Y happen”.

### **Design principle 1**

If the university wants to ensure lifelong learning concerning the rapid development of digital technology, then:

- Develop a formal strategy that supports regularly market analyses concerning: a) the companies' need for education and b) what are other actors on the market are offering.
- Make sure that the strategy is agreed upon by all staff that are involved or affected by the strategy.

### **Design principle 2**

If the university wants to balance time-consuming bureaucratic procedures with companies' demands for fast access to modern courses, then:

- Analyse existing local documents and processes from a combined university and company perspective.
- Ask the questions: “Is there an *over-regulatory* governance described in local documents and processes? Can time-consuming internal bureaucratic procedures be condensed?”
- Find a balance between bureaucratic procedures and being an attractive university without tampering legal issues.

### **Design principle 3**

If the university wants to admit students based on prior learning concerning work experience, then:

- Develop unambiguous criteria/measurements which support rules of law.
- Include criteria of a different kinds (e.g., general, specific, quantitative, qualitative)
- Involve the administrative department from the commencement of the project.
- Customise existing digital tools so as to support submissions concerning both formal and work experience.

### **Design principle 4**

If the university wants to ensure attractive lifelong learning that is in the forefront, then:

- Develop formal structures for competence development concerning teachers.
- Formulate a competence development plan that balances organisational and individual goals.
- Make sure that all teachers are engaged in research.
- Include competence development concerning digital advancements regarding the core subject, digital tools, and pedagogical methods.

### **Design principle 5**

If the university wants to ensure that courses are based on both rigour and relevance, then:

- Include companies at all stages of the course development process.
- Make sure that companies are not reduced to passive information providers; they should participate as active course designers.
- Allow both rigour and relevance to be in the foreground at the same time.

## *THE COURSES*

In this research paper, the central findings have to do with challenges and design principles. The purpose of also presenting the courses is to provide a background for the challenges and design principles. Consequently, the courses are just briefly presented in terms of their names and a few key words. All courses correspond to an identified competence need of the companies. In total 11 courses are suggested:

- Digital transformation and disruption (e.g., business models, models for change analysis, digital institutions, barriers hampering digital transformation).
- Digital leadership (e.g., IT management, best practices, lean, project management, management styles, organisational studies, strategical thinking).
- Agile development (e.g., Kanban, rapid prototyping, emergent technologies, test-driven development).
- Digital resources (e.g., digital technology, digital data, resource sharing, the artefact concept, infrastructure for data storing, cloud computing).
- New data sources and methods for data collection (e.g., crowdsourcing, social media, internet of things).
- Elements of artificial intelligence (e.g., machine learning, deep learning, smart data analysis, automation, data analytics, combinations of artificial and human intelligence, visualisation).
- Data science (e.g., prediction, clustering, detection of anomalies, association rules)
- Digital innovation (e.g., problem-solution pairing, creative idea generation, innovation methods, open innovation)
- Service development and value realisation (e.g., service-dominant logic, service science, co-creation of value, customer relationships, service ecosystems)
- Data- and information security (e.g., resilience, best practices, data protection, risks (e.g., phishing, whaling), cyber security, integrity, ethics)

## **DISCUSSION**

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Talmage et al. (2018) proposed twelve themes for further analysis. One of them reads: “How do we design and structure lifelong learning programs and institutes that will sustain or thrive for the long-term and have long-term impact for lifelong learners?”. Our findings can be regarded as a response to this question.

The purpose of the literature review was to present existing knowledge (what is known), and the purpose of the findings is to present design knowledge (what we need to know) concerning the development of an education program supporting lifelong learning which considers the rapid development of digital technology. The purpose of this section is to discuss “what is known” in relation to “what we need to know”. In order to discuss the findings, we return to the remarks presented in the literature review. These remarks can be regarded as arguments for what we need to know more about. Below, we discuss the remarks in relation to the challenges identified, the quotes from the participating companies and the suggested design principles.

*Remark 1: Lack of support for lifelong learning concerning the development of education programs that consider the rapid development of digital technology.*

In order to be attractive, universities need to catch up with the rapid development of digital technology and continuously implement new knowledge in education programs (Chitiba, 2012; Inoue-Smith, 2017). One quote from the companies reads: “The structural transformation is changing rapidly”. This means that companies need knowledge and tools to support the reallocation of labour and other valuable resources across processes and activities to enhance their digital capabilities. Another strik-

ing quote from one company reads: “Universities need to be competitive and flexible in order to retain their position as a market leader of higher education. Otherwise, there will be a disruption concerning how education will be organised and by whom”. The underlying message in this quote is that companies will not regard universities as their primary education partner in the future if they do not adjust their curriculums to meet the latest progression in digital technology. The accessibility of new knowledge is essential for companies to retain competitiveness. The experiences from the ADR project provided information about the necessity of implementing a specific strategy that supports the identification and implementation of advancements in digital technology.

*Remark 2: Lack of empirical evidence concerning the suggested support for designing education.*

Our literature revealed that only a few articles present empirical evidence (e.g., Shum, 2009) concerning suggested support for designing lifelong learning. These articles have provided valuable knowledge based on theoretical insights, but are lacking in empirical validation. In the ADR project, the observations made are grounded in both empirical experiences and theoretical insights. We collected and analysed real primary data from a collaborative project consisting of academics and practitioners. This meant that we utilised the advantages of having access to primary data, which in its turn meant that we minimised the risk of: over- or under-interpretation of data that someone else collected, not detecting salient features of data, not having control of the data collection and analysis process, and making inappropriate re-contextualisation.

*Remark 3: Lifelong learning is related to more than target groups’ participation in courses.*

Based on the literature review, we realised that most articles discussed lifelong from the perspective that new knowledge was acquired through students’ participation in courses. Our study has identified that the design of lifelong learning is a process that entails more than just the students’ participation in courses. In the ADR project, we realised that the process of designing lifelong learning includes *design, participation and evaluation* of courses. The target group for the courses consisted of companies; we involved 20 companies in all these stages in order to ensure valuable input throughout the whole process. One quote from the companies is: “Companies need to be part of the course planning process. To be competitive, we need to make sure that we can get the competence we need”. This quote expresses a need to make an impact on the course design. In the ADR project, the companies realised that it was not sufficient for them to respond to interviews conducted by academics. They wanted to have a real impact on the course design since the content of the courses was crucial for their competitiveness. In the ADR project, the possibility to impact on courses was offered by arrangement of collaborative workshops for course design and course evaluations. A second quote from one of the companies reads: “One reason to participate in the project is to interact and learn from other organisations”. This quote emphasises that learning did not only take place between academics and practitioners; it also took place between organisations. In the ADR project, workshops involving all the academics and companies were organised. The topics of these workshops were to discuss the design and evaluation of courses.

*Remark 4: Lifelong learning concerns both individuals and organisations.*

This remark is based on the observation that most studies focus on the lifelong learners and the impact of lifelong learning on them (e.g., Bass et al., 2017; Bridgstock, 2013; Dzakira et al., 2012; Holland, 2019), while few studies pay attention to lifelong learning concerning organisations and their structures (e.g., Dunlap & Lowenthal, 2013; Forman et al., 2002; Shum, 2009; Wilson et al., 2007). In the ADR project, we have focused on the design of learning for individuals (students, teachers) *and* for organisations (universities). The importance of competence development for teachers as individuals is recognised by Day (2002) and Scales and Kelly (2012). In the ADR project, the challenge identified concerns for *how to* manage competence development with regard to the teachers’ individual goals, scheduled time for competence development, and possible conflicting organisational goals. Unambiguously, the universities most valuable resource is the teachers. Hence, it is necessary to create and follow-up competence plans for teachers.

We also found it essential to identify other aspects of lifelong that concern organisational (university, company) goals. In the ADR project, we have recognised the university's need to adapt in order to meet requirements from companies. For example, we have in particular addressed issues such as “how to balance time-consuming bureaucratic procedures with companies' demands for fast access to modern courses” and “procedures for admission of students based on prior learning concerning work experience”. This means that the universities' capability to offer attractive education to companies to a large extent depends on the teachers' collective knowledge and competence, and on how the university can adapt to meet requirements concerning flexibility put forward from companies. We recognise that equipment such as digital tools, pedagogic material and infrastructure also play an important role when defining the capabilities of universities.

*Remark 5: Lack of prescriptive knowledge.*

The review of the literature revealed that almost all the identified support of the design of lifelong learning (recommendations, principles, guidelines, guides, strategies, advice) consists of normative prescriptions (e.g., Zitter 2010). As mentioned in the “Literature review”, we differentiate between normative (what to do) and descriptive knowledge (how to do). Both normative and prescriptive knowledge are also concerned with justificatory knowledge (why to do). Our interpretation is that normative and prescriptive knowledge are closely intertwined. In the ADR project, we needed to understand “what”, “how” and “why”, when designing the courses. Consequently, the suggested design principles are including elements concerning the “what” and “how”, while the description of the challenges justifies the design principles.

*Remark 6: Lifelong learning as a collaborative effort.*

One observation from the literature review is the positive experience from engaging stakeholders from outside of the university (e.g., Agerbæk & Houmøller 2018; Dealtry 2009). As mentioned above, the ADR project involved 20 companies from the IT sector that face similar competences challenges due to the rapid development of digital technology. This meant that the ADR project was highly collaborative and that there were several interactions between academics and companies which are described in the “Project Characteristics”. A quote from the companies is “Trust is a prerequisite for successful collaboration”. Trust is a social process that relies on expected positive value outcome regarding all involved parties. It is also built on mutual respect for different interests. In the ADR project, trust was enabled by a) the creation of an agreement between the parties that regulated the responsibilities, the resources each party should bring to the project, and what activities each party should carry out. Our experience is that the involvement of companies positively contributed to the attractiveness of the courses, and their relevance to the companies. A second quote reads: “Increased collaboration between universities and companies is the future”. The idea of involving companies in the ADR project was originally expressed by one of the academics. The idea was based on a need from the discipline of Information Systems. The fact the quote comes from a practitioner implies a mutual interest to collaborate in the future. Interestingly, both the university and the companies have recognised the collaborative advantages.

## CONCLUSIONS

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The purpose of our study has been to create knowledge supporting the development of education programs concerning lifelong learning and rapid development of digital technology. The main conclusion is that the rapid technological development causes universities to face a strategic imperative to broaden access to lifelong learning. Universities have to change their strategy from only targeting an exclusive group of younger students to including a mixed student population consisting of both young and adult students.

To fulfil our purpose, we have presented five challenges and five design principles. The challenges were: lack of strategy for how to handle rapid development of digital technology, time-consuming internal bureaucratic processes, lack of knowledge about validation of prior learning concerning work

experience, lack of management of continuous competence development of teachers, and lack of knowledge regarding how to ensure practical relevance and retain scientific rigour. Based on a root-cause analysis, we can conclude that the root cause of the challenges can be traced to a lack of strategy for how to handle the rapid development of digital technology. This means that the other challenges can be seen as effects caused by a lack of strategy. We can conclude that the presented challenges represent an extension of prior work by a) being based on empirical evidence from an ADR project that involved seven academics and 20 companies, b) providing more detailed descriptions, and c) being supported by quotes from companies.

The purpose of the design principles is to forefront design knowledge that can be reused in new situations, which means that the design principles are generalised from their contextual application in the ADR project. The generalisation offers a possibility for them to be applied within other contexts that share similar characteristics. We can conclude that the design principles supported the development of the courses. We can also conclude that the presented design principles extend prior knowledge by: a) providing both normative and prescriptive knowledge, b) being based on empirical evidence (the successful actions taken in the ADR project), and c) the formulation of a set of actions for how to handle different aspects of the challenges. As mentioned in the section “Findings”, the challenges and design principles form an integrated whole, since the design principles reflect the challenges.

Moreover, we can conclude that the academic-practitioner collaboration in the ADR project supported the application of both a university and company perspective on design of lifelong learning. This helped us to uncover, understand, and meet challenges in a way that were acceptable from both parties. Finally, our study contributes to two practices. Firstly, the developed education program targets practitioners and addresses a competence need expressed by the companies. Secondly, the identified challenges and the design principles should be considered by other universities that are planning to implement education involving digital technology that supports lifelong learning. We also recommend other companies that are interested in collaboration with universities to consider these.

The challenges and design principles are based on experiences acquired from one project. As future research, we suggest further validation of both the description of the challenges and the formulation of the design principles. We also suggest a comparison concerning the structures of the university we have analysed and how these structures may differ internationally. Furthermore, we suggest a historical analysis that uncovers how university structures, bureaucracy, regulative documents, and other characteristics have developed over-time.

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