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School of Digital Technologies

Digital Transformation: Learning Practices and Organisational Change in a Regional VET Centre

Master's thesis

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Thesis has been supervised by Prof. Tobias Ley and PhD Kai Pata.

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Table of contents

Introduction

One of the flagship initiatives for the Europe 2020 – a ten-year strategy of the European Union – is "Digital agenda for Europe". Digital economy is growing faster than any other sector and it is said to create five jobs for every two jobs lost in some other area (European Commission, 2014). However, what this growth rate implies is that organisations as well as individuals are experiencing a rapid change brought about by the increased use and fast development of digital technology. This change is often described as digital transformation.

For organisations, digital transformation usually brings along new work practices, new procedures, even new business models or changes in organisational structure. For the people working in these organisations, it means learning new skills or even changing attitudes or mind-sets about their work. Moreover, it often requires changing the way they acquire those new skills and knowledge in the first place, as the old traditional methods turn out to be insufficient to respond to the pace of change.

Developing formal training takes time and resources, so that it is often several steps behind of the reality of workplace. At the same time, the employees inevitably learn to respond to the novel problems and challenges while fulfilling their everyday tasks. If this day-to-day individual learning would be scaled to reach the organisation and become organisational learning, the organisations' ability to respond to change and transform would improve.

As the reader will learn in the following chapters, the organisations that manage to transform themselves successfully take a strategic approach to change. They determine their objectives and implement new working and learning practices to accomplish those objectives. Nevertheless, implementing change – may it be then organisational change in general or change in learning practices – is still neither an easy nor a straightforward process, and failure tends to be more often reported (Burnes & Jackson, 2011).

Thus, the problem addressed in this thesis is that digital transformation and implementation of workplace learning practices which would support this transformation continue to present a challenge to the organisations. This challenge usually means tackling a complex mixture of different factors, like established structure and work processes of the organisation; the

characteristics of the industry; the target group of the services or products of the organisation and many more.

The present thesis is going to analyse the dynamics between the digital transformation in general and implementing new learning practices in particular on the example of a regional vocational education and training (VET) centre, Bau-ABC Rostrup, in Northern-Germany. It will examine the dynamics between workplace learning practices and organisational factors during an intervention programme (training activities and introduction of learning technology to support such training) targeted mainly at the trainers (*Lehrwermeister*) of Bau-ABC Rostrup. In doing so, the author aims to fulfil several goals:

- Firstly, to provide an overview of digital transformation and workplace learning, their characteristics and the dynamics between them.
- Secondly, find out how organisational context influenced the implementation of workplace learning practices in Bau-ABC Rostrup.
- Finally, describe and evaluate the interventions carried out in Bau-ABC from the perspective of implementing learning practices and digital transformation.

In order to fulfil those goals, the author seeks answer the following questions:

- What are the characteristics of digital transformation and workplace learning, and how do they influence each-other?
- How did various aspects of the organisational context influence the implementation of new workplace learning practices in Bau-ABC Rostrup?
- How effective were the interventions carried out in Bau-ABC in implementing new workplace learning practices and supporting overall digital transformation process?

The methodology used for the present thesis is action research. The qualitative data for the analysis was gathered mainly during the implementation period of the interventions in Bau-ABC Rostrup. During this period, the author was a full-time intern at Bau-ABC Rostrup and part of the team which carried out the interventions. The organising team consisted of several Bau-ABC trainers and external partners, who had been involved with Bau-ABC for several years due to a joint project. The data consists of the author's reflections, interviews with representatives of various parties involved in the interventions, and project documentation.

The thesis consists of four chapters. The first chapter will provide theoretical background in digital transformation, workplace learning and implementation of learning practices. The second chapter will introduce action research in general, the context of the present research and data collection instruments. The third chapter will provide detailed description of the research process and initial conclusions. The fourth chapter contains more detailed discussion and final conclusions.

1. Literature review

This chapter will first provide an overview of digital transformation as a specific type of organisational change. Secondly, it will look into workplace learning and the relationship between digital transformation and workplace learning practices. Finally, will give a brief overview implementation of learning practices, especially the IntelLEO implementation model.

1.1. Organisational change

Organisational change and implementing change have had their share of researchers' attention for decades. Todnem (2005) notes that several generic approaches have been proposed which analyse organisational change from various perspectives, for example based on its rate of occurrence (e.g. discontinuous, incremental), on how the change comes about (e.g. planned, emergent) or based on the scale of change. However, there is still little agreement on how to cope with change (Todnem, 2005) and failure of change programmes is quite widely reported (Burnes & Jackson, 2011).

Rapid development of digital technologies in the recent years has brought into attention organisational change triggered by the usage of digital technologies, as more and more companies start to explore the possibilities provided by these technologies (Matt, Hess, & Benlian, 2015). This kind of organisational change has often been termed as *digital transformation.*

1.1.1. Digital Transformation and Learning

Matt, Hess and Benlian (2015) describe digital transformation as a significant shift in the business operations, products, processes and organisational structure of a company which accompanies its initiatives to make use of digital technologies. In the Learning Layers research report (Attwell et al., 2015), the authors assume a similar point of view, defining digital transformation as a process in which organisations transform themselves to adjust to and make use of digital technologies. Differently from the term *digital disruption* and the

discourse surrounding it, the Layers researches see more evidence of companies taking steps to adapt to change, not being overwhelmed by it.

The literature on digital transformation emphasises its strategic nature (Matt, Hess, & Benlian, 2015; Uhl & Gollenia, 2014), or as formulated by Kane, Palmer, Phillips, Kiron and Buckley (2015) "ability to digitally reimagine the business". Transforming the business as a whole, as opposed to focusing on single technologies, is what distinguishes the digitally maturing companies from the companies in early stages of digital maturity (Kane et al., 2015).

As in every organisational change, organisational learning plays an important role in and is tightly connected to digital transformation. Kane et al. (2015) point out that intolerance of skills gaps is one of the distinguishing features of digitally maturing organisations. However, as digital transformation often involves a significant change in all aspects of an organisation, then also the habitual learning practices may turn out to be inadequate to cope with this change. Clow (2014) concludes that no matter how productive are organisation's learning and development departments, they will not be able to create a solution for acquiring every skill or piece of knowledge necessary for the organisation to run effectively.

Thus, the digitally maturing companies do not only provide training to their employees, but they do it in novel ways which allow for flexible, self-organised learning (for example online just-in-time learning) and more importantly, they implement new working practices which support collaboration and generation of new ideas (e.g. cross-functional teams) (Kane et al., 2015) – which means also more knowledge sharing and learning from colleagues.

When speaking about organisational learning, it is important not to forget that organisations consist of people and organisational learning cannot be fully explained without considering individual learning at workplace. Schuchmann and Seufert (2015) find that in the context of digital transformation personnel and organisational development should be interlinked. This means focusing on self-organisation and competence development of each employee: providing and integrating formal and informal workplace learning as well as supporting collaboration and teamwork.

However, learning in organisation is also connected or even dependent on other aspects of the organisation's functioning. Schuchmann and Seufert (2015) argue that in addition to connecting learning to the strategy of the organisation, essential frame conditions for learning

at all levels of the organisation are organisational structures and culture. What they refer to is that working arrangements and practices, decision-making and behaviour systems should be adjusted to facilitate learning practices supporting digital transformation.

Atwell et al. (2015) also find that wider adoption of innovative technologies for learning calls for other supportive measures, e.g. in the fields of infrastructure, data protection and management, pedagogy, working arrangements and knowledge development. They point out five areas, in which shortcomings often hinder adoption of new learning technologies: attitudes and knowledge, technology readiness and infrastructure, data security and privacy, business models and innovation take up.

Matt et al. (2015) list four essential dimension of an organisation which digital transformation strategy should address: use of technologies, changes in value creation, structural changes and financial aspects. Use of technologies here covers both the attitude as well as capacity to deploy such technologies. Structural changes refer to the rearrangements in the organisational setup to accommodate changes in value creation (Matt, Hess, & Benlian, 2015).

Also Clow (2014) discusses the changes in organisational setup which would support the continuous organisational learning. She considers workforce management on one hand and prioritisation and planning on the other to be essential aspects which need to be adjusted to enable the organisation be innovative and successfully solve new problems.

It appears from the viewpoints brought out above that learning practices for digital transformation should go hand-in-hand with adjustments in value creation and financial aspects, technology infrastructure and its usage, organisational structure, especially working arrangements and practices, and organisational culture.

1.2. Implementation of learning practices and organisational change

The dynamics between implementing learning practices, technology to support learning and the organisational change in has been also tackled by various implementation frameworks. In this thesis, IntelLEO (Intelligent Learning Extended Organisation) implementation model will be used to examine the organisational factors influencing the adoption of learning practices for digital transformation. IntelLEO implementation model draws on a wide range of

literature and combines different approaches form software domain as well as knowledge management.

The IntelLEO model is designed to support technology-enhanced learning and knowledge building activities in intelligent extended organisations. These are communities which come into being when two or more different organisations (for example businesses, educational institutions) partner up for a limited period of time to strengthen their organisational responsiveness via common learning and knowledge building (LKB) activities (IntelLEO, 2012).

The implementation model takes a situated change approach proposed by Orlikowski (1996), who views organisational change an inherent part of organisational life, rather than a temporary phase of transition (Orlikowski, 1996). Based on this approach, implementation in IntelLEO framework is seen as a continuous, participatory process whereby members of the organisation adjust their practices to cope with change. This view of change is important from the perspective of the present thesis, as it will study the changing learning practices in a flat organisation where important change agents are the practitioners themselves.

The IntelLEO implementation models divides the implementation of technology-supported learning and knowledge building activities in three main phases: participatory design, implementation and responsive organisation. The participatory design phase focuses on engaging stakeholders; analysing the needs and opportunities of the organisation and the employees; creating LKB vision, and designing appropriate and effective technology (IntelLEO, 2012).

The implementation phase includes identifying and addressing critical barriers, defining implementation plan and training and facilitation plan. In the third phase of the model, organisational and individual gains will be examined and the feedback gathered will serve as an input for the next implementation cycle (IntelLEO, 2012). The critical barriers pointed out in the implementation part of the IntelLEO model – organisational policy, roles and responsibilities, technology usage, tensions and conflicts, control processes, organisational culture – address in detailed manner the areas relevant to digital transformation in general and changing learning practices in particular.

In the context of present thesis, IntelLEO model will be used firstly, to provide a broader frame of reference for the change process in the organisation studied and secondly, examine a number of organisational factors which were seen to influence the implementation of learning practices in the given case.

1.3. Workplace learning

In order to better explain the dynamics between organisational change, digital technologies and learning practices, the following section will describe the characteristics of workplace learning. Secondly, it will introduce a workplace learning model by Ley et al. (2015), which looks at workplace learning across different levels of analysis – individual, group, network and collective level.

1.3.1. Characteristics of Informal learning at workplace

In their literature review, Manuti, Pastore, Scardigno, Giancaspro & Morciano (2015) conclude that in the workplace context, the *term formal* learning is used to describe planned learning activities aimed at helping people to gain specific knowledge, awareness and skills for doing their job well. Formal learning is assumed to take place away from actual work and it usually takes the shape of programmes sponsored and supported by the organisation. Nevertheless, Manuti et al. (2015) also recognise that learning situations are complex and include mostly elements of both informal and formal learning.

Thus, it might be more useful consider formal and informal learning on a continuum, as described by Eraut (2004). He perceives informal learning as a kind of learning which is close to the informal end of formality-informality continuum, where at the informal end is implicit, unintended, opportunistic, unstructured learning without a teacher. This continuum-perspective is also assumed in the present thesis, as clear-cut lines are often difficult to draw in the real life, where many learning activities (e.g. peer-tutoring) would fall into a kind of semi-formal category. Also there are frequent interactions between formal and informal arrangements, such as when a formal training is followed up by the establishment of an informal community for knowledge exchange, or when informal and self-directed exploration of a topic leads employees to participate in formal training courses.

In his studies of professionals from various walks of life, Eraut (2011, 2004) found that at work, people tended to learn much more informally, i.e. while doing the actual work rather than from formal training events. It was often a mixture of learning from personal experience and from others (Eraut, 2011).

Many other authors have come up with similar findings: for example, Kooken, Ley and de Hoog (2007) found that knowledge workers use face-to-face help-seeking or digital sources on the internet to fill their knowledge gaps. Attwell (2007) reports that most of the learning which takes place in European SME-s, be it face-to-face or using digital technology, is informal and social.

Nevertheless, there are some disadvantages to informal learning at workplace: it is often expensive, random and limited to one person or a small group in a specific context (Ley et al., 2014). However, from the viewpoint of digital transformation, as was discussed in the first sections of this thesis, it is essential to harness the power of informal learning among the members of the organisation to speed up organisational learning. Therefore, a better understanding of workplace learning is called for.

1.3.2. Models for Informal Learning at Workplace

There are several models which try to explain informal learning, but these models often tend to omit one or the other aspect its complexity (Za, Spagnoletti and North-Samardzic, 2014). Some models focus on individual level and leave out group and collective level (Marsick and Watkins, 2001); others do address the group and collective level, but do not explain how learning dynamically crosses these levels (Ley et al., 2015).

At the same time, such understanding is crucial to enable organisations learn faster, innovate and remain competitive, as it enables the organisations to pick up innovative ideas faster (Ley et al., 2015). These innovations also include learning and making use of constantly changing digital technologies. If the mechanisms of informal workplace learning are understood, the organisations can take measures in the relevant areas (as identified in the sections 1.1 and 1.2) and have the full benefit of the knowledge created in everyday work.

What seems to characterise some of the recent approaches to informal learning at workplace is focus on practices on one hand and patterns or scenarios which connect those practices on the other. For example, Za, Spagnoletti and North-Samardzic (2014) describe a framework

with three central practices – reflection on daily activities, knowledge sharing and innovative behavior (testing and adjusting novel techniques). These practices are connected by feedback and feed-forward loops which form different patterns on two dimension: locus (within or across the organisational boundaries) and feedback (feedback to oneself or feedback from others) (Za et al., 2014). The model provides a good overview of the main dimensions and activities of informal learning, but does not go into detail with explaining how these feedback- and feed-forward loops work between individual, group and collective level.

Ley et al. (2015) argue that these levels are connected by two processes – knowledge maturing and scaffolding (Figure 1). Knowledge maturing is an overarching process which links individual learning to a group, collective and organisational learning; scaffolding is a process whereby individuals are supported and influenced in their learning by collective knowledge. Knowledge maturing and scaffolding take place through a number of practices. Scaffolding occurs when:

- an individual turns to a more knowledgeable peer or group when facing a problem (*help seeking*);
- a more knowledgeable peer or group helps the learner to find a solution (*guiding/co-ordinating*);
- support to the learner is reduced as their skills improve (*fading*) (Ley et al., 2015).

Knowledge maturing occurs when individuals:

- make use of previously known ideas and practices (*appropriating*);
- share their experiences and ideas in a group (*sharing*),
- work out a solution or an artefact together with peers (*co-creation*),
- make a new idea or solution more suitable for wider spreading (*formalising*)
- work out a solution or idea into a guideline or standard adopted in the whole sector (*standardising*) (Ley et al., 2015).

Furthermore, there is a two-sided practice in which both processes are at work: in case of *negotiating/grounding*, a common understanding is sought on both individual and group level (Ley et al., 2015).

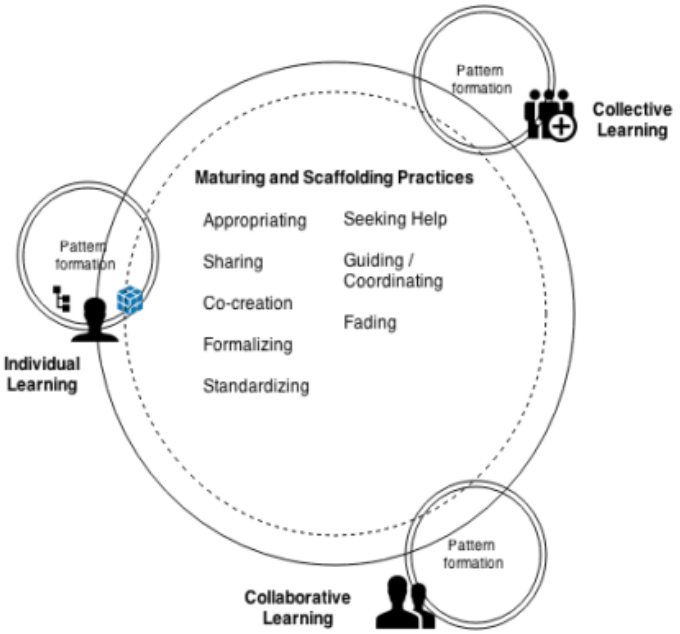

Figure 1. Learning on different level of analysis and their interaction (Ley et al., 2015)

Knowledge maturing and scaffolding practices are connected via feedback loops (Ley et al., 2015) – for example, workers test individually a problem solution proposed by a colleague and then give feedback shared in the group, where common approach will be negotiated. Digital tools and increasing connectivity make such switching between the individual, group and collective even easier and almost seamless (Ley et al., 2015).

Ley et al. (2015) also point out that knowledge maturation evolves around knowledge artefacts: members of an organisation create new knowledge as a common object of activity, which takes the shape of instruments, procedures, rules etc. These conceptual (e.g. rules) and material (e.g. products, tools) objects are mediating i.e. they link together knowledge processes, people and communities (Hakkarainen, 2008). At the same time, all activities are mediated by the tools and sign systems used, which thus shape our experience and practices (Nardi, 1996). This relation between artefacts and practices implies that implementing new learning practices requires also new tools, technologies and conceptual artefacts, such as for example organisational rules.

In the present thesis, the model by Ley et al. is used to analyse changing learning practices of the trainers *(Lehrwerkmeister)* who conduct initial and continuing vocational education in Bau-ABC Rostrup (more detailed information about Bau-ABC Rostrup will be given in the

second chapter). The model is seen as ab able to explain wide range of workplace learning practices, and thorough the concepts of knowledge maturing and scaffolding, provide a comprehensive description of the interactions between individual, group and organisational learning. The latter, in turn, is an essential aspect when considering workplace learning practices in context of digital transformation.

This chapter has provided an overview of the complex relations between digital transformation, workplace learning practices and their implementation in organisational context. By using the theoretical frameworks discussed it this chapter – the informal workplace learning model by Ley at al. (2015) and the IntelLEO (2012) implementation framework – the following chapters set out to answer two remaining research questions: how do the various aspects of the organisational context influenced the implementation of new workplace learning practices in Bau-ABC Rostrup? How effective were the interventions carried out in Bau-ABC in implementing new workplace learning practices and supporting overall digital transformation process?

2. Methodology

The methodology of the present thesis is action research. Action research is carried out by people working or living in certain social contexts, i.e. by the insiders (Kemmis, McTaggart & Nixon, 2013), as distinguished from traditional research, where practitioners are studied by professional external researchers (McNiff and Whitehead, 2011). Typically, action research is cyclical, consisting of "action-reflection cycles" (McNiff and Whitehead, 2011).

The study presented in this paper consisted of four cycles which were carried out in Bau-ABC Rostrup in autumn 2015. Each cycle consisted of a weekly face-to-face training session at the end of the week and concomitant preparation and follow-up activities. Training sessions were conducted by a team of internal facilitators (trainers of Bau-ABC Rostrup), external facilitators (staff of University of Bremen, *Institut Technik und Bildung* - ITB), and coordinator (the author of the thesis). Each training session was preceded by co-ordination/reflection meeting between the coordinator (the author) and the external facilitators, which were documented in the minutes. In addition, separate meetings took place between the external-internal facilitators or, if that was not possible, between the coordinator and internal facilitators.

During the week between the sessions, the coordinator provided individual support to the participants in form of individual tutoring or e-mails. These interactions, together with the feedback gained by facilitators during the sessions, served as input which was reflected on during the facilitators' meetings and electronic correspondence and used to inform the next sessions.

At the end of each week, the author analysed the past cycle in her reflective diaries. General feedback about the whole cycle of interventions was gathered during a joint feedback and evaluation session for all the participants. The session was documented by two external facilitators in form of notes and reflections in a blog.

To provide the participants the benefit of hindsight, evaluation interviews were conducted with several participants three months later. Additional information about the design of the interventions and participants is provided in section 2.2.

2.1. Research context: Bau-ABC Rostrup and Learning Layers

In order to provide the reader an overview of the research context, the following section will describe the role of Bau-ABC Rostrup (hereinafter Bau-ABC) in the German dual vocational education system as well as the history of the organisation in the Learning Layers project. Also the role of trainers as the main target group of interventions in this thesis will be described in more detail.

Bau-ABC is a vocational training centre of Northern-German construction industry. The organisation has altogether 65 employees, 29 of whom are the trainers (E. Emken, personal communication, April 26, 2016). The trainers of Bau-ABC are typically men over 30, the average age being 44 To cater for the practical training needs of 19 training occupations provided in Bau-ABC Rostrup, the centre has 17 large training halls on 75 000 m^2, designed to accommodate 550 apprentices daily (Bau-ABC Rostrup, n.d).

Bau-ABC is part of the German dual vocational education system in which the vocational training is mostly divided between two learning venues: the enterprise and the vocational school. In some cases, however, there is a third learning venue separate form vocational school and enterprise (BiBB, n.d). Bau-ABC represents that third type of venue, a so called inter-company training centre (*überbetriebliches Ausbildungszentrum*). It is mainly focused on the practical training of apprentices (*Auszubildende*), the young people in vocational training and plays an important role in shaping the work practices of the future generation of professionals. The funding for inter-company training in mainly provided by SOKA-BAU, the social funds for the German construction industry (Emken and Engraf, 2014), which is financed by the construction industry itself in form of obligatory contributions[1].

As Bau-ABC is in the training business, then digital transformation for them has meant making use of digital technologies to enhance their training offer. The management has seen the usage of digital technologies as an opportunity to create “the fourth learning venue”, in addition to three traditional learning venues. This fourth venue would be accessible to the

[1]However, in return, the construction companies receive reimbursements for training expenses or extra retirement-back-up plans from this fund, if they offer such services (M. Campbell, personal communication, April 29, 2016).

apprentices wherever and whenever, providing opportunities for independent learning and supporting their professional development.

This initiative to explore and make use of digital technologies means a considerable change in the work of trainers (in German: *Lehrwerkmeister* – LWM). Trainers are practitioners with special qualifications, who supervise the apprentices while they gain practical work experience in the training centre where the mistakes are less costly than in the real work situation at the company. Trainers work schedule is tight and they spend most of their working week in the so-called training halls (in German: *Werkhallen*) (Figure 1), advising apprentices in the execution of their projects and evaluating the results and work process.

Figure 1. A training hall in Bau-ABC Rostrup, as seen from a trainers work room

2.1.1. Bau-ABC Rostrup and Learning Layers Project

In 2012, Bau-ABC became an application partner (as distinguished from the universities as research partners) in the Learning Layers (hereinafter "Layers" or "Learning Layers" project, with the initial aim to digitise its so-called "white folder"[2].

[2] White folder, like the name says, is a bulky physical white-coloured folder for project documentation (the main learning material for apprentices in Bau-ABC), kept by each apprentice during their three-year vocational training.

Learning Layers is a four- year research project carried out by an international consortium of 17 organisations (universities, public institutions, companies) all over Europe. The project is co-funded by the Seventh Framework programme of the European Commission and focuses on creating technologies to support informal learning in workplace, especially in small and medium-sized enterprises (SMEs). The project is built upon co-design approach, so that the actual users of the technologies to-be-developed are involved in the process from the very start.

The main goal of the project is scaling informal learning in SME-s with the help of digital technologies. This involves developing tools which enable the employees co-create and share learning resources and opportunities as well as scaffold individual learning. These processes, in the long run, would enhance the competitiveness of individuals, companies and networks involved. The project activities take place in two pilot clusters - one in healthcare and the other in construction sector – both being so far modest or uneven in their technology adoption (Learning Layers, 2013).

The Layers project started out with two strands of research – exploratory and design strand – being pursued in the pilot clusters. First, project partners initiated exploratory studies to find out how learning takes place in the involved healthcare and construction organisations at the moment. This phase in turn provided input to and alternated with co-design activities involving end-users, designers and developers. The design strand resulted in four initial designs for applications to support informal learning in workplace (Ley et al. 2014). Several of those designs transformed during the later iterations and new designs were added.

In the first year, diverse user-engagement activities were carried out in Bau-ABC e.g., site visits by the research partners to Bau-ABC Rostrup, interviews, focus groups, and joint workshops at the site with trainers, construction professionals and apprentices to understand the nature of their work. These activities in turn provided input for the co-design process, including conversational workshops, storyboarding (apprentices and trainers visualising their typical working days), and design meetings (discussions around specific tasks and solutions) (Kämäräinen, n.d, (a)). The insights gathered during those events fed into the initial design idea of “Sharing Turbine” – an application to replace the “white folder” (Kämäräinen, n.d (b)).

It was during the later phase of the co-design process that the research partners involved (Pontydygsu and ITB – *Institut Bildung und Technik* of University of Bremen) agreed to start with multimedia training sessions for the Bau-ABC Rostrup trainers. The training was aimed at raising trainers' awareness of web tools and apps in general as well as their specific uses in training and education (Kämäräinen, n.d (b)).

As the project proceeded, the initial idea of digitising white folder was gradually abandoned. The partners realised that digitising the existing documentation would be a lengthy and effortful process and most likely not an optimal solution. A new idea emerged instead, that of a Learning Toolbox[3] – a mobile app that allows creating custom collection of web resources and learning content for mobile devices (Kämäräinen, n.d (b)). The idea of multimedia training, however, became a reality and a number of sessions were organised in 2013 – 2015. Out of these multimedia training sessions grew a training concept, which served as a basis for the interventions in the main focus of this thesis. Thus, an overview of these workshops will be provided in the next section.

2.1.2. Development of "Theme rooms" Training Concept

The following description is based on the logbooks of the workshops, where the organisers (Layers' research partners) documented the time, participants and aims of the workshops; learning tasks for the participants; issues arisen during the workshops and general conclusions.

The first multimedia training in 2013 was a one-day event on a working day, which served as a pilot to determine what kind of training will be needed in Bau-ABC during the rest of the Learning Layers project. The main topic was apps for construction industry – what kind of apps are there, what are their pros and cons and different possibilities to construct apps. In addition, provisional plans for following workshops were laid out.

Another multimedia workshop followed some months later. It was a two-day event on Friday afternoon and Saturday morning, consisting of five workshops, where wide range of social media and multimedia tools (microblogging, blogs, QR-codes; cartoon and multimedia collage sites) were introduced to the participants.

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[3] Now available also to general public: https://play.google.com/store/apps/details?id=com.raycom.ltb

Three further multimedia trainings were also arranged in spring and summer of the following year, all of them two-day events. These workshops focused on hands-on video editing and annotation and introduced social bookmarking, microblogging and augmented reality tools.

The multimedia training sessions described above took place mostly during the weekends or on Friday afternoon i.e. initially, no dedicated time slot was found for such trainings during the work time. This was probably one of the main reasons why the participation of the Bau-ABC trainers and other staff remained moderate, usually slightly under ten people. The attendees (including few members of the management) were mostly people personally more interested in the topic.

However, by the autumn 2014, the Bau-ABC staff who had participated in the training sessions thought that from that point on, the training could be continued internally as informal, optional meetings of the trainers (P. Kämäräinen, personal communication, 30 April 2016).

In spring 2015, the Layers research partners were called to demonstrate Learning Toolbox (at the time still in development) during the traditional internal training days[4] of Bau-ABC Rostrup. The Layers' partners demonstrated the functionality of the software and organized workshops, where different work tasks and possibilities to meaningfully employ digital tools in typical "white folder" projects were discussed (Kämäräinen, 2015a).

By the time of internal training days, the Bau-ABC staff had reached the conclusion that occasional voluntary meetings would not be enough build up their digital competences to work with multimedia, web tools and Learning Toolbox (P. Kämäräinen, personal communication, 30 April 2016).

Thus, despite a limited reach, the training events described above played an important role in the digital transformation process of the organisation as they resulted in:

- general awareness of different types of digital technologies among the Bau-ABC and how these can be used in the field of business of the organisation (i.e. vocational training);

[4] Each spring, there is one week when Bau-ABC Rostrup and its small branch, ABZ Mellendorf, remain closed for several days and the whole staff gathers in one of the centres to participate in internal training.

- general buy-in in the further exploration in the usage possibilities of digital technologies in Bau-ABC Rostrup;
- recognition that voluntary training outside the worktime will have a low attendance and thus moderate impact;
- recognition that further training is needed for the staff of Bau-ABC Rostrup;
- conclusion that in the future, such trainings would be during the working time and thus, part of the duties of the trainers.

Furthermore, a small proactive group of trainers had reached a level of skills which allowed them to keep up and improve blogs and Facebook pages for their trades, which had been set up during the multimedia trainings. Slowly, this group also started to serve as peer tutors, sharing their knowledge to other colleagues who showed interest in their work.

During the training days in spring 2015, these trainers presented their vision, how multimedia training in the future should look like: the training would take place in physical and virtual "theme rooms" (Themenräume). The participation would be flexible, so that trainers would join a certain room for one theme when they needed support and leave the room when their learning need had been met. When users had left a room, this theme would be archived and new rooms opened (Kämäräinen, 2015b).

There were four topics proposed by the trainers for a start: use of social media, making use of Learning Toolbox, creating digital learning material (drawings, videos, quizzes) and data management (data security, open educational resources, copyright) (Kämäräinen, 2015b). This concept proposed by the trainers served as a basis for the interventions in the focus of the present thesis.

In sum, in the end of this first development cycle it was acknowledged that in order to gain larger involvement of staff and especially trainers in the digital transformation process, a more systematic approach is needed. It was realised that in order to be able to benefit from the opportunities provided by the digital tools, the trainers should achieve similar level of basic digital competences and learning practices which would help them to respond to the change which digital tools would bring in their work. Also the issue of organisational implications of introduction of digital tools needed exploring. Thus, an action research project was called for

which would involve closer interaction with the trainers, faster feedback cycles and reflection on the impact of the activities conducted.

2.2. Action research

According to Kemmis, McTaggart and Nixon (2013), there are two features that all approaches of action research tend to have in common. Firstly, they recognise the ability of people living and working in certain contexts to be researchers of their setting and secondly, participants themselves carry out the research in order to change their settings and practices i.e. research is conducted by 'insiders' (Kemmis, McTaggart & Nixon, 2013).

Somekh (1995) points out that action research bridges the gap between research and practice and allows the researcher to make a difference in real life contexts. In addition to researcher-as-participant principle, what sets action research apart from other methodologies is that its findings serve as a basis for immediate adjustments in practice, which, in turn, are geared towards broader change. Action research is pragmatic in data collection and research process, allowing the practitioner to combine his/her work duties with research and cope with the limitations of the given setting. It be conducted by an individual, but it is still aimed towards collaboration – social interactions enable the researcher to involve other members of the group in the research and by extension, in the change process (Somekh 1995).

McNiff and Whitehead (2011) propose series of steps which can be used an initial plan for an action-reflection cycle. These steps include considering the situation carefully, identifying the problem and thinking of a way to proceed; putting the plan into action, monitoring and gathering data about what happens, evaluating the progress, testing the validity of the knowledge acquired and finally, modifying the practice according to results.

This focus on action, involvement and change are also the reasons why action research was chosen as a methodology for the present thesis. It allows people involved in a certain setting to take action to achieve a real world impact and at the same time, systematically analyse and evaluate their work practices and the results achieved.

In the present thesis, the aim to improve practice works on several levels: on the one hand, it was the organising team (partly consisting of trainers) who sought to improve their approach in supporting trainers acquiring digital competences and this way, the digital transformation

of the training centre as a whole. On the other hand, it was the trainers themselves, actively providing input to the training activities, trying out, and negotiating how and when to use digital technologies in their work.

2.2.1. Programme design and participants

Empirical part of the present thesis was in large part carried out during a two-month-period in autumn 2015 when the author of the thesis worked in Bau-ABC Rostrup. In the centre of the interventions were training activities and introduction of several web 2.0 and multimedia editing tools. The first month was mainly spent on the preparation of the training activities (the so-called "theme-rooms", introduced in section 2.1.2); the activities themselves were carried out in the second month.

The main goal of the interventions, as stated to the participants, was to develop the participants' knowledge of digital tools to ensure that everyone would have at least the same basic skills. This was meant to be a step towards using the digital tools to support training process and independent learning of the apprentices. Another aim for the organisation was to support the informal, peer-supported learning practices among the trainers, to enable the organisation to adopt new digital technologies flexibly and with optimal use of resources.

Altogether 25 trainers the director of the training centre, head of the continuing education department and three employees of the IT-department attended the training in Bau-ABC Rostrup[5] (althogether 30 participants) main location. The participants were divided into four groups: each group had 6-7 members and two facilitators per group, so that the team of facilitators for consisted altogether of 8 people.

Each group had two facilitators. One of the facilitators was a trainer from Bau-ABC and the other facilitator from ITB (*Institut Bildung und Technik* of University of Bremen). ITB as the nearest Learning Layers partner to Bau-ABC Rostrup had been the main organiser of the earlier co-design and training activities in Bau-ABC, thus the internal-external facilitators new each other already before in most cases.

[5] At the same time, the training was also carried out in a small branch of Bau-ABC Rostrup, ABZ Mellendorf, which is over 150 km away from Rostrup (employs four trainers and two continuing education specialists). The focus in this thesis is on Bau-ABC Rostrup, as this was author's main place of work.

In initial design of the activities, it was seen that the workshops would be fully facilitated by the trainers as peer tutors. A few weeks into the preparation period, the external partners were included, as some topics (intellectual property rights concerning social media and digital learning materials) needed external expertise and more facilitators were needed to keep the groups small and the workload manageable for internal facilitators.

Prior to the training activities, face-to-face semi-structured interviews were carried out with the trainers in their habitual working environment. The aim of the interviews was to involve the trainers early-on and gain a better overview of their training needs, experience, attitudes as well as mobile devices at their proposal.

The interviews focused on questions such as 1) what is the trainers' experience in using digital technologies in their work; 2) what are their expectations towards the upcoming training series; 3) whether they had participated in the earlier multimedia trainings; and from the infrastructure side 4) what kind of mobile devices are provided to them by the employer.

The face-to-face training sessions took place once a week in four parallel workshops (larger number of sessions and longer duration of the activities was not possible due to an approaching holiday season). The sessions were always held on Fridays and lasted for 80 minutes. This arrangement (once a week, 80 minutes) was due to organisational restrictions and work schedules of the trainers, which did not allow for any other time or any more time.

The workshops had two topics or themes: creation of digital learning materials and social media. There was also third, minor topic – intellectual property rights – for which one external facilitator was planned to make short presentation in each group. Each time, there were two groups attending workshops on one topic and two groups attending workshops on the other. One workshop was duplicated mainly in order to keep the groups small (the other issues around the design of the training are discussed in the section 3.2). In the initial design of the programme, it was planned that after two sessions, the groups switch the topic, so that all four groups attend two workshops on digital learning material and two workshops on social media.

The week that remained between each session allowed the training team to develop an action-reflection cycle. The following week before the new session, most of members of organising team met face-to-face to evaluate the previous session, share experiences, exchange feedback

gathered from the participants and adjust their approach for the next session. In addition to face-to-face meetings, communication and preparation took place via email, Skype[6], phone calls and the shared Google Drive[7] folder.

A week before the beginning of the programme, there was an information session for the participants introducing the training activities and practical arrangements (group division, rooms etc.). For the initial evaluation, a feedback session was scheduled a week after the programme, where all the participants could share their impressions, provide feedback to the organisers and make suggestions for further improvements.

The author of the thesis served as a coordinator of the training activities. She organised the preparation activities between the internal facilitators and external facilitators (meeting face-to-face was not always possible); helped to prepare the learning materials for the workshops; provided the participants individual support between the training sessions and gathered their feedback.

During the two-month preparation and training period, the author worked closely together with the Project Manager of Bau-ABC Rostrup, a long-time employee who provided the author insight about the organisation, previous multimedia trainings and support in the preparation activities. Later, this knowledge was supplemented by practical experience in the organisation, observations and conversations with other employees.

In addition to actual activities, an important part of the whole intervention was introducing educational technology – multimedia tools and websites, which were either designed for educational purposes or educational uses of common social media. Depending on the previous experience of the participant, these tools and services meant learning several new concepts (cloud, shared document, social media, privacy settings, embedding etc.) and new ways to cooperate and create.

The virtual infrastructure of the training activities was a joint Google Drive folder. The folder included presentations shown during the sessions and additional support material, divided into two subfolders: one on the topic of digital learning materials and the other on the topic of social media. In addition, both folder included a Q&A documents for participants to present

[6] https://www.skype.com
[7] https://www.google.com/drive/

their questions to facilitators; folders or documents for the participants to present their independent assignments; guidelines for using Google Drive.

In the third chapter of the thesis, the four cycles of the action research process will be analysed, each cycle centred around one training session. Conclusions drawn from each cycle are presented the aspects considered relevant from the viewpoint of digital transformation: tools and practices, technical infrastructure, digital competence and organisational routines.

2.3. Data collection instruments

Diverse qualitative data will be used to examine and evaluate the impact of interventions on the learning practices of Bau-ABC trainers in an organisational context of digital transformation.

The author reflected on her experience on a weekly basis in her reflective diaries, most of the times using the “What?”, “So what?”, “Now what?” (Borton, 1970) reflection model. On one hand the author described preparatory activities, adjustments made in the training programme and challenges faced by the organising team; on the other issues arising from technology infrastructure, usage of digital tools and trainers’ digital competences, and issues related to organisational routines and work arrangements.

The weekly meetings of the coordinator and external facilitators were documented in the minutes, which contained summary of general impressions and lessons learnt from the session of the past week, feedback gathered and steps for future action. Additional documentation is provided by author’s e-mail correspondence with facilitators and participants, and one of the facilitator’s notes about feedback and evaluation session. Summary of the training sessions and the feedback and evaluation session were also compiled by another external facilitator a week after the end of the whole programme.

Evaluation interviews were carried out with three trainers and the Project Manager of Bau-ABC Rostrup three and a half months later, when they could better assess the impact of the interventions could be better assessed. Three trainers and Project Manager of the organsation were interviewed. The interviewees were chosen so as to obtain a cross-section of different viewpoints and experiences: one trainer had participated in the training programme as a facilitator; one trainer whose skills were on the intermediate level, and one trainer who had

been doing his first steps with the digital technologies introduced during the training. The Project Manager as the main driver of Bau-ABC's participation in Learning Layers was seen to represent the point of view of the organisation as a whole. Interviews were recorded and transcribed.

Minutes, author's email correspondence and reflections and summaries by external facilitators were used to construct detailed overview of the activities undertaken in each cycle.

Directed content analysis (Hsieh and Shannon, 2005) was conducted on author's reflections, evaluation interviews and notes on feedback and evaluation session to a) assess the impact of the interventions on the learning practices of the trainers, b) establish the role of organisational factors on the implementation of learning practices. Codes were defined on the based on the informal learning practices as described by Ley et al. (2015) and the implementation framework of IntelLEO (2012) model.

The following chapter will first provide an overview of action research cycles and then examines the impact of the interventions based on the results of the content analysis.

3. Action Research Cycles

This chapter is going to examine the four action research cycles described in the previous chapter one-by-one. Each of the following sections describes one cycle out of four, focusing on the actions taken and conclusions drawn from each cycle. The conclusions are divided into four areas identified as relevant for digital transformation: tools and practices, technical infrastructure, digital competences and organisational routines.

3.1. First cycle

The first session was preceded by more careful **planning and preparation**, as some of these preparations served as a basis for the whole project. For more general preparation, the organising team gathered two weeks before the first session in Bau-ABC Rostrup for a joint workshop.

During the workshop, **virtual infrastructure** was set up in parallel to the discussions. A shared Google Drive folder was created with separate folders for facilitators (to prepare materials) and for participants (for learning materials and independent assignments). The participants' folder contained two main subfolders, one subfolder for each of the themes. A Google sheet template was created provide a rough structure for each workshop: presenting the agenda and learning goals for the workshop, followed by more detailed presentation of the topic, brainstorming and discussion, practical exercises, and finally, introducing independent assignment. It was also decided to deviate from the original concept and cut the number of themes down to two (creation of digital learning materials and social media). Intellectual property rights was made into as a transversal topic (introduced briefly in each group) and Learning Toolbox was left out as a topic due to infrastructure limitations and lack of time – fever topics allowed to go more in-depth with each topic.

To discuss the **digital tools and websites** to be introduced in the first cycle, the coordinator (having previously consulted with the internal facilitators) had one more meeting with the external facilitators week before the first session. For digital learning materials, an online testing site Goconqr[8] and presentation-sharing site Slideshare[9] were planned; for social media,

[8] https://www.goconqr.com

Facebook[10] and Twitter[11] were considered. Also Google Drive was to be introduced as the virtual infrastructure for the training. As Google Drive was a new tool also for the internal facilitators, the coordinator provided them individual tutoring beforehand.

Few days before the first session, the internal and external facilitators had another meeting, to go over the workshop plan and the tools together. Day before the session, Google Drive link on the relevant materials was sent to the participants. Sharing settings were adjusted for everyone with the link to have editing rights – creating accounts in the workshop would have to be time-consuming.

The **training session** was conducted in four 80-minute parallel workshops at the end of the working week. Two groups started out with general introduction into social media with main focus on Facebook; two other groups with general introduction into creation of digital learning materials with main focus on Goconr. Presentation of the topic and brainstorming were conducted by the external facilitator, the hands-on part by the internal facilitator. For the following week, the participants received and independent assignment to be reviewed in the next session. The social media groups had to reflect in a shared Google document about their social media preferences or make a post on Facebook. Digital learning materials group had to create short quiz or mindmap in Goconqr, and add a link to their resource in a shared Google document. Participants were also encouraged to write any questions they have during the week in a shared Q&A document.

For the **reflection of the first cycle** (impressions, lessons learnt during the workshops) and general planning for the next cycle, the coordinator met with the external facilitators in the beginning of the week following the first training session. Feedback about the workshops was received from the participants and internal facilitators via different channels during the week (minutes of the trainers' meeting, coordinator's individual conversations with trainers) and the passed to the external facilitators by the coordinator. Internal facilitators as peers of the participants received more immediate feedback at the workplace.

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[9] http://www.slideshare.net
[10] https://www.facebook.com
[11] https://twitter.com

3.1.1. Conclusions on first cycle

Tools and practices

The internal facilitators, being trainers themselves, already hosted Facebook sites for their trades, which served as examples and basis for the discussion in the social media groups. These trade-specific (e.g. well-builders', carpenters' etc.) sites are used to post photos and videos of apprentices' work to show their achievements and create a community around their trade.

However, not all the participants were in favour of such usage of Facebook and some participants avoided creating accounts for themselves. Sometimes this attitude was due to privacy concerns, wish to keep private and professional life clearly separated, or lack of knowledge about the privacy settings. Nevertheless, in most cases the already existing sites were admired.

Digital competences

The first session highlighted even more the differences in digital competences, with some trainers having considerable experience and others only moderately. Some participants were actively sharing their experience and asking questions, while others were struggling to follow discussion or tasks undertaken.

One of the participants admitted later in the evaluation interview that there were too many new words and concepts, which he could not relate to his previous knowledge: *"There were many things and words with which I could not do anything, which were foreign for me… I have no association to these words*"[12]. However, there was also one trainer who admitted feeling empowered after the first session when he had experienced how easy it actually was to make a Facebook site for his trade.

It also became clear that the groups had very different interests and working speeds. Thus, also independent assignments given to the participants started to deviate of what the organising team had initially planned.

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[12] In German*: "Da war viele Wörter, viele Dinge womit ich nichts anfangen konnte, die mir fremd waren - die Zusammenhänge zu den Wörter fehlt mir*."

Technical infrastructure

Some shortcomings of the technical infrastructure were identified during the preparation period. From the preparatory interviews with the trainers it had appeared that not all of the trainers had smartphones, which was also one of the reasons why Learning Toolbox had been abandoned as a workshop topic. It had also emerged that the wireless network in the main building was relatively week, so that IT-department installed internet cables for each of the participants' laptop for the time of the workshops.

The first session also revealed some differences between the assumptions of the organising team and actual infrastructure available: one of the groups worked in a computer lab where all computers were connected to one user and separate network. Thus, they could not access their local mailboxes to confirm accounts on Goconqr. However, for the next session, a solution was found together with the IT-department – an application which enabled web-based access to the participants' mailboxes.

Organisational routines

The first cycle showed that the time-span allocated for the training activities (80 minutes in Friday afternoon) was not conducive to learning. Participants were tired of the working week and short time span set its limit to the activities so that some activities or tools had been dropped from the agenda. However, the time span could not be changed, as there was not any other gap in the trainers' schedules where they would not have apprentices to supervise.

Thus, the organising team concluded that in addition to brainstorming, only one practical activity with social media or creating digital learning materials could be done in given time-limit. Furthermore, the facilitators should limit the information given and activities undertaken only to the most relevant ones. Brainstorming part could not be made shorter, as it was essential to get everyone involved.

3.2. Second cycle

The meeting of the coordinator and the external facilitators after the first cycle for reflection served also as a general **preparation and planning** meeting for the second cycle. In addition, two pairs of external/internal facilitators agreed for more in-depth preparation via Skype talk

and the other two pairs of facilitators had a face-to-face meeting few days before the next workshops.

During the week, the coordinator provided **individual support** (usually as a mix of face-to-face meeting and email correspondence) to participants (a) who had expressed the need for more support during the preceding interviews, or (b) when she noticed a problem e.g. a link to an independent assignment led to an unpublished material. These interactions were also used to ask feedback about the previous workshops.

Few days before the next workshops, the reminders were sent out to the participants about their independent assignments and the possibility to add questions to the shared Q&A document.

The **training session** was conducted in four 80-minute parallel workshops at the end of the working week. The social media groups continued with Facebook (reviewing independent assignments) and proceeded to discuss blogs on the example of existing blogs of Bau-ABC trainers. Digital learning materials' groups finished with Goconqr (reviewing independent assignments) and proceeded to video editing in Windows Movie Maker[13]. The basic setup of the workshops remained the same (introduction of the topic, brainstorming and discussion, hands-on activity).

As independent assignments, one of the social media groups had come up with ideas for their blogs and the other group was tasked to finish the assignment given for the previous session (filling in a shared document on social media preferences). Digital learning material groups had to edit a short video (could be done in pairs) and upload it to a specified folder on internal network.

For the **reflection of the second cycle**, sharing feedback and planning of the next cycle, external facilitators and the coordinator met in the beginning of the week after the second training session.

[13] http://windows.microsoft.com/en-us/windows/movie-maker

3.2.1. Conclusions on second cycle

Tools and practices

It appeared that the introduction of Google Drive during the first session was not enough to make the participants take advantage of its benefits. The shared Q&A sheet for the participants was not used, but not because the participants did not have any questions. Rather, these questions were posed to the coordinator directly, when she visited the work halls to gather individual feedback or provide support. However, large part of the participants did add their homework (links to quizzes, reflections) into the shared documents, as this was compulsory part of the training.

Technical infrastructure

Made careful by the technical hiccups of the previous session, the coordinator tested beforehand on the computers in the computer lab to ensure that Windows Movie Maker, which was in plan for the group in the computer lab, runs properly. This saved the facilitators some inconveniences, as it appeared that the programme did not work correctly on all the computers. This issue was solved with the help of the IT-department. However, as the other groups used laptops which were distributed among the trainers, then these could not be checked.

During the workshops it appeared that several laptops were not able to render the videos (either being old or not powerful enough) which was disappointing to the participants. However, this issue did not have any quick solution but rather, required action on managerial level.

Digital competences

To compensate for the lack of time during the face-to-face sessions, the coordinator provided individual support to the trainers who had been perceived as less experienced with digital tools. The trainers themselves could determine the time slot for such appointments. During the feedback and evaluation session after the intervention, this availability of flexible support was much appreciated by the trainers.

Organisational routines

Scarcity of free moments during the working was also one of the main reasons why many trainers did not manage to complete their independent assignments and solidify their learning. However, there were also case where a trainer did more than asked and produced several online tests for his apprentices instead of one.

The differences between the groups, their interests and accordingly also which topics had been addressed in the workshops had become even more clear. Therefore, several facilitators proposed to abandon the initial idea that after two sessions, the groups switch their topics, rooms and trainers. Continuing with the same trainers would have enable the groups have a smoother learning experience, finish the assignments with the same facilitators and continue pursuing the programme adapted to their interests.

Other members of the organising team however argued that this would mean deviating from one of the main goals of the intervention – to provide participants with the similar basic skills. Furthermore, the differences between the activities and tasks conducted groups had already been criticised by the participants after the first session – even though adapting the activities was in the interest of the participants. However, after some discussion, it was decided to follow the participants' wishes, so that the facilitators continue with the same groups and switch the topic when suitable for that particular group.

3.3. Third cycle

As usual, the meeting of the coordinator and the external facilitators after the previous cycle served also as a general **preparation and planning** meeting for the third cycle. One pair external-internal facilitators met face-to-face also few days before the training. For other trainers, face-to-face meeting was not possible and they specified their plans for the next workshop via phone calls.

During the week, the coordinator provided **individual support** to participants face-to-face or and via e-mail. Few days before the training, email reminders about the independent assignments were sent to the participants.

The timing and arrangement of the **training session** remained the same as in previous cycles (four parallel 80-minute workshops at the end of the working week).

The two groups who had started with the creation of digital learning materials proceeded to the topic of social media. Differently from initial plan to switch the facilitators and themes for the groups after two sessions, the groups remained with the same facilitators. The two social media groups continued to work on blogs and did not switch to the topics as initially planned. In one of these groups, focus on studying the four existing of blogs by Bau-ABC trainers; in the other, creating their own blogs. The digital learning materials groups finished with the topic of video editing and proceeded with general introduction to social media and with hands-on activities in Facebook.

As to independent assignments, one of the social media groups had to think of ideas for their own online quiz. In the other groups, the assignments differed according to participants' previous experience and whether they had managed to do the previous assignments.

For the **reflection of the third cycle**, sharing feedback and planning of the next cycle, external facilitators and the coordinator met in the beginning of the week after the third training session.

3.3.1. Conclusions on third cycle

Tools and practices

In the groups which proceeded to blogs, issues arose around openness and knowledge sharing – these will be discussed under organisational routines. In addition to the question of sharing and openness, the participants started to discuss ways how blogs could be used to integrate various resources (photos, videos, documents etc.).

Technical infrastructure

During the preceding week, it appeared that there is a conflict between Windows Movie Maker and graphics cards on most of the trainers' computers, so that after rendering, all that was displayed was a blank screen with sound. This caused somewhat of a drop in the motivation of these trainers who did take the time to do their independent assignment.

At the same time, the organising team had started to foresee better possible problems arising from the infrastructure. For example, knowing that the computer lab is separated from the rest of the internal network, the group who was likely to need to access their photos in the next

workshop was warned beforehand that they will not access the network drive where their photos are stored.

Digital competences

No further issues concerning digital competences arouse during this cycle.

Organisational routines

The third cycle brought into attention the need for organisational guidelines or at least common understanding concerning usage of social media in professional context. During the discussions in workshops it became clear that participants (including members of the management) had different ideas how and for which purposes social media should be used in work context. For example, one participant said to use Facebook as a means of increasing the visibility of the centre among the young people, without having thought about its uses for supporting learning, whereas the trainers used it to demonstrate learners' achievements and create a community around their trade. Another controversial issue was how open should the trainers be in their blogs. There were concerns that when the trainers make their project documentation and learning material public in the blogs, the competitors – other training centres – could copy their work.

For the organising team, the third session had meant a though choice between learners' wishes and needs and goals set by the organisation. By choosing to follow topics that the learners in some groups had asked, it was clear that the tools and topics discussed in the initial social media groups and initial digital learning materials groups will be different, as the duration of the programme would not allow for more sessions to make up the difference.

3.4. Fourth cycle

As usual, the meeting for initial reflection after the previous cycle served also as a general **preparation and planning** meeting for the next cycle. This time, only external facilitators attended the meeting, the coordinator could not participate due to health reasons. One pair of external-internal facilitator met later also face-to-face, but rest of the co-ordination activities between the coordinator, internal and external facilitators were done via email and phone calls. In the last round of workshops, the facilitators could use in the materials prepared previously by the other facilitators for groups who had already tackled that topic.

During the week, the coordinator provided **individual support** to participants face-to-face or and via e-mail. Few days before the training, email reminders about the last training session were sent to the participants. To compensate for the differences in the digital tools and websites covered in the groups, the facilitators compiled step-by-step instruction slides (e.g. on how to create a blog) and placed them in the Google Drive.

The timing and arrangement for the **training session** remained the same as in previous cycles (four parallel 80-minute workshops at the end of the working week). The two groups which had started out with social media proceeded to creating mindmaps and quizzes in Goconqr and embedding them into blogs. The two groups which had started out with digital learning materials proceeded to or continued with social media, especially Facebook and privacy settings in Facebook.

For **feedback and reflection** on the whole set of four cycles, a feedback and evaluation meeting for all the participants and facilitators took place a week later. The conclusions from this meeting will be discussed in the last section of this chapter.

3.4.1. Conclusions on fourth cycle

Tools and practices

During the week preceding the last cycle, a few questions were actually posted in the shared Q&A document Google Drive.

Technical infrastructure

No further issues arouse concerning infrastructure during the fourth session.

Digital competences

During the week which preceded to the last session, special attention was paid on providing individual catch-up opportunities to the trainers who had missed several workshops. These trainers had also received support from their colleagues.

Organisational routines

Some pairs of external-internal facilitator had already formed their own preparation routines and did not need any intermediation by the coordinator; in case of the others, some mediation by the coordinator was still necessary. Inevitably, the more time pressure the facilitators

(either internal or external) had with the own work duties, the more coordination was needed to ensure that the workshops are prepared and the facilitators have a common understanding of the setup of the workshop.

In the next chapter, the conclusions presented in this section will be supplemented by the insights gained from the evaluation interviews to examine the impact of the interventions on the workplace learning practices of the trainers and the role of organisational factors in the implementation process.

4. Discussion and Conclusions

This chapter examines to which extent the interventions described above supported the informal learning practices described by Ley et al (2015). Secondly, it will analyse how the organisational factors and procedures influenced the implementation of these learning practices using the IntelLEO (2012) implementation framework.

4.1. Impact of Interventions on Learning Practices

The following in section will examine the impact of the interventions described in the previous section on the workplace learning practices described by Ley et al. (2015). Discussion will be based on the observations and feedback gathered during the interventions, evaluation and feedback session and the evaluation interviews conducted some months after the interventions.

The brainstorming sessions during the workshops became often lively discussions, where the more experienced users *shared* their knowledge with the less experienced users or non-users by explaining and bringing examples of their own experience. This aspect – working with their colleagues in small groups – was much appreciated during the evaluation and feedback session, where the participants agreed that the internal informal knowledge sharing works. One of the interviewees also pointed out that the training sessions were one of the few occasions where the participants could collaborate with colleagues with whom they otherwise have relatively little contact (trainers of different trades, IT-department etc.): *"The cooperation as I saw it was very good in the groups and I believe there was also some space there to work with colleagues with whom you usually don't have much contact /.../ that was seen as very positive by many"*[14]. Thus, the interventions supported knowledge sharing on a more collective level than the habitual cooperation between the trainers of the same trade.

In addition, the participants gained experience with cloud-based tools and by making their independent assignments, participated in *co-creation* of shared documents. The adoption of

[14] In German: "*Die Kooperation so hatte ich den Eindruck war sehr gut in den Gruppen und ich glaube es war auch ein kleiner Raum da mal mit Kollegen zusammen zu kooperieren mit den man sonst nicht zu viel zu tun hat /.../ das haben viele doch sehr positiv gesehen.*"

co-creation practices by using digital tools remained different though: in the evaluation interviews, one of the trainers said he did not use the materials in Google Drive as it remained too new and distant for him; one of the facilitators, however, who had used Google Drive only moderately before, adopted it later for a large project where several documents had to be edited by physically distributed parties.

One of the internal facilitators said during the evaluation interview, that due to the questions coming from colleagues, he made a small additional informal workshop on Facebook sometime after the interventions. In this respect, the interventions also strengthened *help seeking* practices among the trainers.

Especially in the workshops on social media, there was considerable *negotiation* in the groups as to how to use social media, especially Facebook, in professional context – whether only as a means of gaining visibility or also for supporting learning. Concerning the usage of blogs, the issue of openness and knowledge sharing versus protecting the organisation's knowledge as a competitive advantage was raised and debated in the groups. During the evaluation and feedback session, the participants agreed that the organisation should adopt a stance in this respect. In this case, it can be said that there was a need for *formalisation* of certain behaviours or patterns required by the participants, which was not realised at that moment though.

There were also some cases of *co-creation* as a result of the interventions – for example, two trainers who used be non-Facebooks users made a Facebook site for their trade. However, it has to be mentioned here that several of the existing Facebooks set up during the earlier multimedia trainings sites were also "supported" by several trainers of the one trade, with one trainer being the main administrator and others making photos for the site (though not always actually posting them). In that sense, the interventions spread the already existing practice.

One common result of the interventions which appeared from interviewees was expanding the understanding of how and which digital technologies can be used in their work, and gaining participants' overall commitment to continue with the training in somewhat adjusted format. (For a small group, this understanding and commitment had been achieved with the previous multimedia trainings.) This can be seen as process of *appropriation* – of the general idea of using digital technologies in their work on one hand – and particular tools on the other.

For example, one of the interviewees, though somewhat sceptical about the usage of digital technologies, said that he can now identify some cases where using these tools would be of help: *"In case of formwork, the providers are in the internet /.../ there I can imagine that the boys* [apprentices] *look up information with these things* [QR-codes]*"*[15].

Another trainer interviewed said that he has been planning to make a video tutorial for his apprentices on horizontal shoring in Movie Maker, but has not managed it yet due to lack of time: *"Actually, I wanted to explain horizontal support with a short video on next Monday /.../ unfortunately, haven't managed to make it yet. But I will do it 100%"*[16].

A significant realisation among the trainers was also that digital tools can be combined to reflect their own learning. During the evaluation and feedback session the participants found that one of the goals for theme rooms should be the creation of trainers personal learning environments: they learn to know new tools and along the way, use them to step-by-step build their own personal learning environments to realise the idea of the fourth learning venue.

In sum, it can be said that the interventions strengthened the practices of appropriation, help-seeking, sharing, co-creation and especially that of negotiation, as the participants were brought to make explicit and negotiate their approaches and assumptions about the usage of digital technology in their work.

4.2. Impact of Organisational Context on Implementing Learning Practices

This subchapter will use the relevant parts of the IntelLEO model to place the interventions discussed above into larger intra-organisational context of implementing technology-supported learning practices (the participation of Bau-ABC in Learning Layers) and examine the influence that organisational factors on the implementation of learning practices in Bau-ABC Rostrup.

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[15] In German: "*Gerade im Bereich Großflächenschalung da stehen ja Anbieter im Netz /.../Da kann ich vorstellen, dass dann die Jungs über so was dann sich Information holen können von einzelnen Hersteller."*

[16] In German: "*Also ich wollte eigentlich jetzt für nächsten Montag den Waagerechten Verbau erklären mit so kleinen Video /.../bin leider nicht dazu gekommen. Und ich mach das 100% noch, dass weiß ich, dass es große Hilfe ist."*

The first two years for Bau-ABC Rostrup in the project can be considered as the participatory design phase of technologies to be the informal learning practices and in a broader context, digital transformation of the organisation. In this stage, the main focus was on engaging stakeholders, needs and opportunities analysis and appropriate technology design.

In form of multimedia trainings (described in section 2.1.2), the facilitation and training activities were started in parallel with the co-design and user engagement activities to build the competences which the trainers would need to work with digital tools in development. These earlier trainings also served as a co-design phase for the interventions in the focus of this study, as based on their experience of these workshops, the participants envisioned their own concept of further training.

Though the number of participants in these training sessions remained moderate, they helped to win the support of the management to the training activities, and for a group of active trainers, work up their digital competences. These active trainers became later internal facilitators for the interventions described in this thesis. Moreover, they serve as lead users for the actual pilots and introduction of Learning Toolbox in the spring and summer 2016.

Thus, taken into account the limits set by the organisational structure, finances etc. (discussed in further detail below) such gradual approach allowed to start building upon the existing informal or semi-formal learning practices. For example, the trainers who had participated in the first multimedia trainings showed their blogs and related their experience during the semi-formal monthly meetings of the trainers and during informal discussions.

The interventions in the focus of this study can be considered as part of the implementation phase of the technology-supported learning, but with a dual goal of not only enhancing the participants' digital competences but also changing the ways they are used to learn, as was discussed in the previous section.

The interventions revealed several **critical barriers** on the general, organisational level which influenced the way these goals could be reached.

In case of **organisational policy**, it appeared that on one hand, there was a clear commitment to digital transformation and developing personnel's competences for this purpose as well as a vision of the so-called fourth learning venue. On the other hand, this commitment did not go as far as to work around the lack of time pointed out constantly by the trainers during the

interventions as well as in the evaluation interviews. Furthermore, there was no clear standpoint taken as how open or closed the organisation wants to be in the digital world.

At the same time, on the level of **roles and responsibilities**, a flat organisational hierarchy, already existing practices of knowledge sharing (e.g. trainers' monthly meetings, cooperation habits between the trainers of the same trades) and the organisation's overall emphasis on the competence development of their employees[17] have served as a fruitful soil for strengthening and implementing new learning practices. However, also this was sometimes hindered by the lack of time, or as one interviewee explained, saying that even if the more competent peer wants to help a less experienced colleague with learning digital tools, the time is just not there.

This perceived lack of time was also a source of **tensions,** as the trainers felt they have to fit even more into their already full schedule. Another, but much smaller source of tension identified during the interviews before the interventions was scepticism towards usage of digital tools in the context of practical training. In some cases, his scepticism was partly due to lack of knowledge or privacy concerns, which were reduced during the interventions so that certain change in attitude could be identified afterwards.

Technology gaps and **usage** are addressed together here differently from the original IntelLEO model, as some of the technology gaps occurred only during the interventions and were not identified beforehand. The main contradiction was that the organisation's technology infrastructure, though well-organised, was not optimised for usage of web 2.0 tools (e.g. protected wireless network was only available in the main building), whereas most of the tools introduced were exactly of that type.

However, the issue of connectivity could only partly be solved by the organisation, as they are dependent on the infrastructure of the internet service provider (the latter did not see enough of a market potential in the locality to upgrade its network capacity). Moreover, according to the Project Manager of the organisation, there are no resources dedicated in the funds allocated to inter-enterprise training centres for building up the digital infrastructure and

[17] During the author's stay in Bau-ABC, the high qualification of staff was pointed out as one of the main competitive advantages of the organisation and increasing one's professional qualification is much supported by the organisation. Highly qualified employees enable the organisation to provide wide range of training as well as create/close courses or curricula faster than competitors to respond to changes in demand.

competences. This means that the organisation has to rely on optimal use of the resource which are there.

Inevitably, the shortcomings of infrastructure had an influence of the adoption of new learning practices and tools. For example, the problems with video editing tool had made many participants give up, as described by one of the interviewees: "*The colleagues said of course that it does not work properly, so I won't do any of that*"[18]. Though for some other problems, the IT-department was ready and found a fast workaround by using a new alternative version to the traditional technology (e.g. web app to access otherwise locally used mailboxes).

In other case where the tools and practices differed more from the habitual ones (such as co-creation in online environment e.g. Google Drive), the interviewees found that more time and support was needed for most the trainers to understand the functioning and recognise the benefits some of the new tools and practices.

As already pointed out above, the **organisational culture** of Bau-ABC was in many ways conducive to implementing new learning practices. Even though there was no actual scheme of awards or incentives, the trainers who adopted innovative practices received recognition from colleagues as well as management. However, as a few interviewees' pointed out, it is still complicated to motivate all the colleagues to catch up with the new practices and tools: there is the fear of doing something wrong or unwillingness to come out of the comfort zone: *"They don't come out of their comfort zone, I would put it this way. Or they have fear to make something wrong"*[19].

This implies that the willingness to take risks, which was considered as an important characteristic to digitally maturing companies, is still somewhat low. Nevertheless, the importance of including everyone was considered very important and expressed repeatedly by different members of the organisation, or as one of the interviewee's phrased it: *"The organisation is only as good as its weakest member"*[20].

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[18] In German: "*Die Kollegen haben natürlich gesagt: es funktioniert gar nicht richtig, also mach ich auch nix."*
[19] In German: *"Die kommen nicht aus sich raus, sag mal so. Oder haben sie Angst davor, etwas verkehrt zu machen."*
[20] In German: *"Das Unternehmen ist immer nur so gut wie das schwächste Glied."*

Few months after the end of the interventions, the wireless network was extended to the whole premises and made accessible to the apprentices. Though restricted by the limitations of the telecom infrastructure feeding the organisation's own network, it can be considered as a sign of the organisation's commitment to the digital transformation process and determination to search for solutions also in limited circumstances.

In sum, it can be concluded there were several organisational factors that had a significant influence on the implementation of learning practices. On one hand, the organisational policy and culture favoured employees' competence development, but on the other, the shortcomings of technical infrastructure and tight work schedules hampered implementing workplace learning practices which would support digital transformation.

Summary

The problem in the focus of the present thesis was that that digital transformation and implementing new learning practices to support that transformation still tend to pose a challenge for the organisations. This paper set out to explore this problem on the example of a regional vocational education and training centre, Bau-ABC Rostrup, in Northern Germany.

Three research goals were set which guided the process. First, literature review was conducted to find out the characteristics of digital transformation, informal learning at workplace and implementation of learning practices. Two theoretical frameworks were found as useful for further examination of the dynamics between digital transformation, workplace learning practices and organisational factors in case of Bau-ABC Rostrup.

In addition, the characteristics of Bau-ABC Rostrup as an organisation and its previous steps in the digital transformation were examined to provide important contextual details.

To implement workplace learning practices for supporting digital transformation in Bau-ABC Rostrup, an action research programme was carried out. The programme consisted of four cycles and lasted for a month. Each cycle was centred around four face-to-face semi-formal training sessions introducing digital technologies which the participants could use in their work (social media sites, multimedia tools etc.). The sessions were conducted as four parallel workshops in four small groups of Bau-ABC Rostrup's staff. The whole programme was preceded by an information session for the participants week before the programme, and followed an evaluation session with the participants and facilitators a week after the programme. Additional evaluation interviews were carried out three and a half months later.

The programme in Bau-ABC Rostrup was carried out by a team of internal facilitators (trainers of Bau-ABC Rostrup), external facilitators (staff of University of Bremen, *Institut Technik und Bildung* - ITB), and the coordinator (the author of the thesis). During the preparation and implementation period of the programme (altogether two months in autumn 2015) the author was an intern and worked full time in Bau-ABC Rostrup.

On the basis of author's weekly reflections, evaluation interviews and other project documentation (minutes of meetings, documentation of evaluation meeting, e-mail correspondence), the impact of the interventions on the learning practices of the participants

were evaluated. In addition, the influence of organisational factors on the implementation was examined.

Based on the results it was concluded that the interventions helped to strengthen several informal learning practices among the trainers, such as appropriation, help-seeking, sharing and co-creation and especially negotiation. The training sessions created time and space for the employees who usually did not have much contact to work together, share their knowledge and experiences concerning the usage of digital tools in their work. This in turn created further basis for engaging in the same practices after the workshops. Especially important here is seen that participants started to negotiate different approaches and assumptions to find a common understanding on where and how to use digital technology in their work. However, the short of a duration of the interventions set it limits to the impact.

However, it was also concluded that organisational factors have quite a strong influence on workplace learning practices for supporting digital transformation. Although the organisational policy and culture in general placed a great value on developing the competencies of their employees, the tight working schedules and constant lack of time perceived by the employees hindered them to engage in workplace learning.

Another influential factor was technology infrastructure, which did not yet have the capacity to support the employees in learning to use digital technologies in their work. Though well-organised, the technology infrastructure was not designed to provide the connectivity, multimedia processing capacity and hardware to support digital transformation (this, however, has been changing after the end of interventions).

Follow-up research to the study presented here could focus on studying the impact of longer-term interventions and follow the development of workplace learning practices in the context of digital transformation over longer period of time. Inevitably, this study was conducted and influenced by specific context. Thus, the dynamics between the workplace learning practices, digital transformation and organisational context could be studied in other settings.

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Resümee

Digitaalne transformatsioon: õppimispraktikad ja organisatsiooniline muutus piirkondlikus kutseõppekeskuses

Magistritöö

Käesolev magistritöö uurib õppimispraktikate ja digitaalse transformatisooni kui teatud tüüpi organisatsioonilise muutuse vahelisi seoseid piirkondliku kutseõppekeskuse näitel. Uurimuse empiiriline osa viidi läbi Põhja-Saksamaal, Bau-ABC Rostrupi kutseõppekeskuses. Töös otsitakse vastust järgmistele küsimustele:

- Mis iseloomustab digitaalset transformatsiooni ja töökohal õppimist ning kuidas on digitaalne transformatsioon ja töökohal õppimine omavahel seotud?
- Kuidas mõjutasid organisatsioonilise konteksti eri tahud töökohal õppimise praktikate juurutamist Bau-ABC Rostrupi kutseõppekeskuses?
- Kui tõhus oli Bau-ABC Rostrupis läbi viidud juurutamisprogramm uute õppimispraktikate juurutamisel ja asutuse digitaalse transformatsiooni toetamisel?

Juurutamisprogramm viidi läbi tegevusuuringu vormis, mis koosnes neljast tsüklist. Iga tsükli keskmes oli pool-formaalses vormis töötoad, mis leidsid aset nädalase vahega nelja grupiga paralleelselt. Tegevusuuringu läbiviijaks oli meeskond, kuhu kuulusid asutuse töötajatest tuutorid, partnerorganisatsiooni tuutorid ja töö autor kui tegevuste koordinaator.

Juurutamisprogrammi evalvatsiooniks korraldati nädal pärast programmi lõppu läbiviijate ja kõigi osalejate vahel ühine kohtumine, kus osalenud said anda tagasisidet ja soovitusi edaspidiseks. Lisaks viidi tulemuste hindamiseks mõni kuu hiljem läbi intervjuud.

Leiti, et programm aitas kaasa mitme töökohal õppimise praktika juurutamisele, kuigi selle mõju piiras programmi lühike kestus. Organisatsioonilise konteksti puhul leidus nii soodustavaid kui pidurdavaid tegureid.

Edasine uurimustöö võiks vaadelda digitaalse transformatsiooni, õppimispraktikate ja nende juurutamise organisatsioonilise konteksti vahelisi seoseid teistes kontekstides.