Dirk Ifenthaler · Sandra Hofhues
Marc Egloffstein
Christian Helbig *Editors*

Digital Transformation of Learning Organizations

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Springer Open

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ISBN 978-3-030-55877-2 ISBN 978-3-030-55878-9 (eBook)
https://doi.org/10.1007/978-3-030-55878-9

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

Digital technology integration is an important mission for every business, organization or institution. The adoption and integration of digital technology is not only crucial for communication, administration and management but also a meaningful asset to support learning and teaching. However, existing models of educational technology adoption and integration predominantly focus on school settings as well as on individual factors explaining the assimilation process. Evaluation models, likewise, mostly emphasize the individual perspective and draw on concepts like media literacy. Accordingly, there is a lack of models for integrating the individual and the organizational perspective. These models could allow for performance analysis as a baseline for human resource development and organizational change.

This edited volume *Digital Transformation of Learning Organizations* aims to provide insight into how organizations change through the adoption of digital technologies. Opportunities and challenges for individuals as well as the organization are addressed. The edited volume provides insights from international research projects and case studies. It features two major parts: Part I provides detailed insights into the project #ko.vernetzt which monitored and supported the digital transformation of an educational organization. Part II features international perspectives on digital transformation of learning organizations.

In Part I, the first chapter titled "#ko.vernetzt – Digital Transformation of an Educational Organization from a Media Educational Viewpoint" reflects on the project #ko.vernetzt supporting the educational organization Kolping-Bildungswerk Paderborn in the process of digital transformation from a practice-oriented media educational perspective (Guido Bröckling, Julia Behr, Julian Erdmann, Chap. 1). The next chapter "Multi-stakeholder Dialogues as Instrument for Design and Qualitative Research in Educational Organizations" focuses on the value of group discussions both as a method of organizational development and as a method of empirical social research (Christian Helbig, Sandra Hofhues, Bence Lukács, Chap. 2). The following chapter "Tracing Digital Transformation in Educational Organizations" discusses quantitative approaches for assessing various aspects of digital transformation from the joint research and development project #ko.vernetzt (Marc Egloffstein, Dirk Ifenthaler, Chap. 3).

In Part II, the opening chapter "Organizational Learning and Digital Transformation: A Theoretical Framework" is concerned with digital transformation as a potential source of crisis for the organization and develops a theoretical framework for further empirical research (Olaf Dörner, Stefan Rundel, Chap. 4). In the next chapter, "Learning Organizations in the Age of Smart Machines", the authors argue that research on the learning organization has, so far, failed to appreciate the relevance of two intertwined loci of learning in organizations: (1) advanced digital systems ("smart machines") and their ever-growing capacity for carrying out tasks and (2) collaboration of employees with these smart machines (hybrid activities and augmentation) (Christoph Meier, Sabine Seufert, Josef Guggemos, Judith Spirgi, Chap. 5). The following chapter "The Concept of a Digital Twin and Its Potential for Learning Organizations" provides a discussion of the concept of the digital twin which is still in its infancy and raises many questions in particular from an educational perspective (Angelina Berisha-Gawlowski, Carina Caruso, Christian Harteis, Chap. 6). Next, "Individualizing Workplace Learning with Digital Technologies" outlines how and where digital technologies are used at the workplace in apprenticeship training, why management has introduced them and how apprentices and their trainers benefit from it (Antje Barabasch, Anna Keller, Chap. 7). "Responsible Digital Transformation of Social Welfare Organizations" provides an overview about organizational development and innovation in the context of social services (Birte Schiffhauer, Udo Seelmeyer, Chap. 8). The chapter "Towards a Theory for Leading Transformation with Digital Innovations in Schools and Universities" takes a hard look at leadership and organization theory and practice, along with a critical look at innovation adoption, to help digital school and university innovation teams in schools and universities find more sustainable, impactful digital innovations (Eugene Kowch, Chap. 9). In their chapter "The "Digital Facilitator", Alberto A. P. Cattaneo, Luca Bonini and Martina Rauseo present the findings of a project that aimed to identify a new professional profile in the context of dual vocational education in Switzerland (Chap. 10). Next, "Sustainability in a Digital Age as a Trigger for Organizational Development in Education" points to structural changes in educational organizations, with a special focus on social relationships and networks (Nina Grünberger, Petra Szucsich, Chap. 11). Then, "Competencies, Culture, and Change: A Model for Digital Transformation" reflects digital transformation and second-order change from a learning science-informed perspective (Jessica Iovinelli, Angela Elkordy, Chap. 12). Antonia B. Scholkmann discusses in her chapter, "Resistance to (Digital) Change", the phenomenon of resistance to change in light of current understandings of the concept as well as new elaborations which might help to pinpoint specific challenges of digital change resistance (Chap. 13). The final chapter of this volume "Digital Transformation in Learning Organizations – Summary and Outlook" takes a summarizing look at the individual contributions of the anthology and discusses the significance of dimensions and design perspectives of digital transformation for learning organizations (Christian Helbig, Sandra Hofhues, Marc Egloffstein, Dirk Ifenthaler, Chap. 14).

Without the assistance of experts in the field of digital transformation, the editors would have been unable to prepare this volume for publication. We wish to thank our board of reviewers for their tremendous help with both reviewing the chapters and linguistic editing.

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Perth, WA, Australia
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Acknowledgement

This research was funded by the German Federal Ministry of Education and Research from 2017 until 2020 (Funding reference number 01PZ16002A-D).

SPONSORED BY THE

Federal Ministry of Education and Research

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Part I
Digital Transformation in the Project #ko.vernetzt

Chapter 1
#ko.vernetzt: Digital Transformation of an Educational Organization from a Media Educational Viewpoint

Guido Bröckling, Julia Behr, and Julian Erdmann

1.1 #ko.vernetzt: Assumptions and Leading Concept

The project *#ko.vernetzt* started in 2017 with the aim to support the process of digital transformation in *Kolping-Bildungswerk Paderborn* for 3 years as an example of a networked educational organization. Based on quantitative and qualitative research, it should be possible to draw conclusions about the challenges an educational organization is confronted with and what kind of support it needs for its development and the development of its stakeholders.

The project's practice activities are built on the premise that forward-looking vocational learning is driven by well-trained employees. Therefore, it is necessary to expand the skills and competences of employees in using digital media tools to analyze and fulfill complex and non-routine tasks in the long run, rather than to only train them once.

To support the digital development of the organization, it is important to promote each employees' media competence, which requires a sustainable qualification of multipliers among the staff. It is not only about broadening the educational program by media education and media didactics. The development of digital learning processes and their structures must be based on the needs of the executive staff and the employees who must be involved from the very beginning of the process.

A media educational qualification and a mentoring program should be constantly developed based on existing framework conditions, experiences, and needs of pedagogical specialists in the various institutions of *Kolping-Bildungswerk Paderborn*. The exchange of views from participants in multi-stakeholder dialogues (qualitative research), seminars, workshops, and webinars and also within the professional mentoring of all practical activities should provide an insight into the

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_1

importance and influence of digital transformation for educational work (Bröckling 2017).

Based on the needs of the employees and the educational work, the support through the implementation of a digitization strategy was accompanied by five action-leading questions:

- What ideas about digitization exist among the employees, and how do these ideas influence their own educational work?
- How can the process of digital transformation be supported, designed, and promoted in the organization for the benefit of all groups of people involved in the organization?
- How can the increase in digital work and organizational processes in educational institutions be dealt with by enhancing media competence among employees?
- How can education staff be strengthened for new challenges of digital education? Are there special needs that can be identified?
- How can one transfer the research results regarding the project activities with *Kolping-Bildungswerk Paderborn* to an open discourse and other educational organizations?

In this project all partners work interlinked: There are partners working in science with qualifications in qualitative and quantitative research (Jun.-Prof. Dr. Sandra Hofhues, Professorship for Media Didactics and Media Education at the University of Cologne, and Prof. Dr. Dirk Ifenthaler, Chair of Business Education V – Technology-Based Instruction Design at the University of Mannheim) and one institution who initiates the practice activities with *Kolping-Bildungswerk Paderborn* (*JFF - Institut Jugend Film Fernsehen Berlin-Brandenburg e.V.*). This includes the support of staff and organizational development (individual media development projects), media education (documentation, networking, and mentoring), as well as the evaluation of developments and progress (scientific documentation, evaluation, and reflection) during the project.

This article discusses the leading concepts of the project *#ko.vernetzt* from a practice-oriented media educational perspective. After outlining the underlying assumptions of the project (1.1) as well as central areas of activity (1.2), the understanding of media competence (2.1), as well as the related topics (2.2) and formats (2.3) of qualification, is outlined and reflected upon (2.4). Finally, the three central perspectives of the project – the organizational perspective (3.1), the employees' perspective (3.2), and the media educational perspective (3.3) – are explained and summarized in Chap. 4. The article is thus intended to outline the approach, the guiding ideas, and the central elements of *#ko.vernetzt* and to bring the media educational perspective into the discourse on the digitization of educational organizations.

1.1.1 Connected Organization: Connected Learning?

In terms of digitization, lifelong learning plays an increasingly important role, especially in professional contexts. The approach of *#ko.vernetzt* therefore assumes that people working in education must be encouraged to constantly bring themselves up to date as employees, to react flexibly and agilely to external requirements, and to generate creative solutions to face challenges as a networked organization. *#ko.vernetzt* therefore asks the question on how learning can take place in a networked way in educational organizations. It is assumed that people must be empowered to implement digital media into educational processes themselves in order to develop as an organization interconnectedly. To achieve such a target, the first steps in digital transformation processes need to be accompanied by a constant dialogue between managers, employees, and external experts. It should be noted that *Kolping-Bildungswerk Paderborn* is a complex, decentralized educational organization. In *#ko.vernetzt* the connection between the networked organizational structure and the networking of learning and communication of the stakeholders should be examined in more detail and further developed in a meaningful way. For this purpose, selected employees should become multipliers of digital education. They should be qualified and accompanied, so that they can carry out their own adequate decentralized development projects and consolidate them in an organized network. The project thus was aimed at the institutional anchoring of work-related digital competence of employees in educational organizations.

Kolping-Bildungswerk Paderborn, located in the northwest of Germany, has approximately 2000 employees, 25 subsidiaries, and over 5000 addressees daily. It appeared to be the ideal testing ground, because it covers the entire educational biography of a person and central education sectors, from early childhood to (secondary) school, vocational education and training, up to training in the post-vocational phase. It is assumed that the diversity of educational programs and the fact that they are networked in a holding company would make it possible to analyze educational measures and institutions in the context of future-oriented digital education and to develop target group-specific, employee-oriented, and modular educational programs. To what extent this has been achieved is to be outlined in an initial appraisal from the viewpoint of media education.

1.1.2 Four Areas of Activity

In order to achieve the goals outlined above, the project *#ko.vernetzt* pursued four central action fields, each in the responsibility of one partner but implemented cooperatively and closely interlinked with the other partners:

1. Qualification Tailored to the Needs of the Employees and the Organization

   The qualification measures (seminars, webinars, learning nuggets), which were conceived and implemented by *JFF – Institut Jugend Film Fernsehen Berlin-Brandenburg*, were intended to enable interested employees to acquire special digital tools and topics in the context of digitization on the one hand and to provide space for reflection and discussion about the integration of digital media in educational concepts and processes on the other. With the meaningful bundling of the partial competences, the target group-oriented promotion of work-related digital competence should be tested and reflected and its approach further developed.

   It should be possible to compile the respective qualification modules in order to obtain a certificate. In addition to a simple certificate of attendance for participating in an individual qualification module, further, graduated certificates were also considered.

2. Individual Media Development Projects

   The initiation of media development projects was intended to strengthen the initiative of the employees to implement their own skills and competences promoted in the qualification into individual project ideas within the organization. These should be accompanied in a "digital learning lab." The projects should build on the respective resources and skills of the employees as well as on existing structures within the organization and enable a sustainable anchoring of the impulses that would be set by *#ko.vernetzt*.

3. Documentation, Networking, and Mentoring

   The employees who participated in qualification seminars should pass on their findings to colleagues in a peer coaching network. The regular exchange about individual (and organizational) progress in the project should also take place via multi-stakeholder dialogues (see Chap. 2 in this volume), in virtual classrooms or blogs. Thematic groups should be formed in which ideas can be developed. In addition, thematic background information should be available for everyone interested on the website www.kovernetzt.de. The media development projects should also be displayed there. For each project, a separate project area with a weblog was set up for this purpose, which can be closed for participants only or made publicly accessible. The participants in the qualification are encouraged to post texts, photos, videos, etc.

4. Scientific Documentation, Evaluation, and Reflection

   The project partners are responsible for the initiation and evaluation of qualification and further training of employees, collect and evaluate findings on the adequate media educational support of an educational organization, and document interim results in a weblog/open book. The multi-stakeholder dialogues should serve the scientifically documented communication about the project, allow indi-

vidual or organizational questions of the participants, and promote the project-related exchange between managers and employees.

The qualification should be anchored and developed in the organizational culture via multi-stakeholder dialogues. Thus, in addition to the added value for the employees and participating institutions during the project, the anchoring and further development of the holding company should be initiated and systematically integrated into the organizational development (see Chap. 2 in this volume; Hofhues et al. 2018).

The present results from the multi-stakeholder dialogues have been summarized in two recommendations for starting activities and three research reports within the project period:

- Gutes Arbeiten mit digitalen Technologien im Kolping-Bildungswerk Paderborn. Handlungsempfehlung UzK-01 (Hofhues et al. 2020a).
- Wissen und Wissensmanagement im Kolping-Bildungswerk Paderborn. Handlungsempfehlung UzK-02 (Hofhues et al. 2020b).
- Bedingungen für Wissens- und Innovationsmanagement in einem Bildungswerk. Forschungsbericht UzK-01 (Helbig et al. 2020a).
- Perspektiven auf (digitale) Technologien von Fachkräften in der Pflege. Forschungsbericht UzK-02 (Helbig et al. 2020b).
- Bedingungen digitaler Lehre in einem Schulnetzwerk. Forschungsbericht UzK-03 (Helbig et al. 2020c).

In this article, the first results from the scientific monitoring are combined and outlined with observations from practice activities from a media educational perspective. The scientific evaluation is under the responsibility of the partners of the University of Cologne and the University of Mannheim (see Chaps. 2 and 3 in this volume).

1.5 Qualification

The qualification of employees, especially in the educational sector of the organization, is a central element of practice activities in the project *#ko.vernetzt*. The project did not pursue a deficit approach to impart (supposedly) missing competences, but an approach that bundles and promotes existing competences in a work-related way. This includes the acquisition of special digital tools as well as their reflection and integration into existing or new educational concepts. However, it is assumed that demand-oriented offers related to digitization and everyday workflow are necessary for the success of the project, both individually and in their entirety.

The program design should be cooperative or participatory, i.e., qualification modules should be selected (and further developed) by exemplary topics in a demand-oriented way with employees. The promotion of media competence and qualification regarding digital education should always be geared to the needs of educational practice. This is linked to the hope for a high level of participant involve-

ment and a certain sustainability. Thus, it was assumed that the digital transformation of educational organizations can only succeed if the employees are adequately involved in the process and their needs, wishes, and resistance are taken seriously. This includes preparing them for changing working conditions. The basic assumption is that, if they deal competently with challenges of the digitized society, they can promote the media competence of their learners and apprentices and prepare them for a professional life in the age of digitization. Accordingly, they need media-pedagogical competence (see also Rohs et al. (2017)).

The project approach initially assumed that two areas of competence are particularly important for employees in educational organizations in the digital age: work-related skills and media literacy related to digital media. Both areas are to be interlinked in the concept of work-related digital competence. After outlining this concept, qualification topics and formats are presented. The chapter closes with a critical reflection on the qualification measures.

1.5.1 1.2.1 Work-Related Digital Competence

In the context of vocational training, a concept of media competence oriented on instrumental skills predominates. It focuses on the usability of dealing with media in an economic sense or the purpose-related qualification for certain digital tools. The concept of media competence in *#ko.vernetzt* also encompasses a reflection on social developments associated with media and digitization as well as individual media action patterns with regard to their social and societal function as a requirement for a confident and self-determined way of living (Schorb and Wagner 2013, p. 18; Brüggen and Bröckling 2017). This is based on an integrated understanding of competence that includes cognitive, motivational, and emotional components (Rausch and Wuttke 2016). Thus, in qualification, aspects of personal development and social capacity to act are given priority over purpose-rational qualification, efficiency, and technical skills (Theunert and Schell 2017). Accordingly, they play a central role in the understanding of work-related digital competence:

1. Work-related digital competence is the ability to constantly keep oneself up to date as an employee (and as an organization), i.e., to react flexibly and agilely to external requirements and generate creative solutions to face challenges as a networked organization. Its aim is to achieve an entrepreneurial and professional "maturity" regarding digital media.
2. In this context, media competence is not only about organizing the use of digital media in everyday working life but also about being able to reflect the context of social development. In doing so, the designed educational process must always include constant technological change and a reflection about how it affects society (media education).

The main objective of the project is the promotion and specification of such work-related digital competence, in which employees are not only enabled to use

certain digital tools. It is an essential component to sustainably anchor digitization in *Kolping-Bildungswerk Paderborn*. The participating employees should be qualified as experts in their respective institutions. As multipliers, they should initiate processes in their working environment, in which they should be supported by the media education experts in the project team of *#ko.vernetzt*.

1.5.2 1.2.2 Topics of Qualification

In order to promote work-related digital competence, central themes of digitization had to be integrated into educational work. These topics were later passed on to employees in various qualification formats – see Sect. 2.3. From framework conditions and legal basics to specific media educational or media-didactic content, various dimensions of digitization were addressed. Individual topics that were originally planned, such as changes in the work environment, gamification and badges, or the programming of apps, were not further pursued. However, seven topics that had already been targeted in the conception were dealt with as planned. Most of them are in the area of educational work, didactics, and pedagogy, but some of them also deal with overarching topics such as collaborative work, knowledge management, and internal and external communication:

Mobile technologies in educational work: Smartphone ban vs. BYOD, sensible use of mobile media in learning contexts, building a technical infrastructure, tools for mobile learning, apps, Web apps and utilities, basics of programming.

Design of digital learning settings: Flipped classroom, webinars and learning platforms as a didactic instrument, understanding of collaborative working and ways of organization, designing digital learning content, visualization of teaching and learning content with presentation tools.

Designing digital educational materials: Digitizing educational materials, exchange of proven concepts in the sense of the open-education idea, designing learning content with learners, film and video as learning tools (instructional films, tutorials, explainities, performance videos), audio work and podcasts (basics, testing), interactive learning posters.

Legal basics: Copyright, terms of use, data protection.

Knowledge management: Digital tools for cooperation, OER, digital mind mapping tools (didactical/technical) and their integration into educational processes, Internet research and WebQuest, reflection and processing of information, professional search strategies, options for documentation.

Collaborative work: Cloud computing, digital organization of work processes and agreements, exchange of educational materials and documents, options for brainstorming, cooperative text work, development of educational materials.

Blogging and websites: Content management, dealing with platforms and blogging software, Web apps and websites, reflection on the potentials in a personal and professional context.

The topics of the offered qualifications can be summarized under different aspects, which are not selective but allow a clustering:

Media didactics and tools for educational work: Presentation tools, learning platforms, collaborative tools, learning videos/explanatory videos, mobile learning, flipped classroom, designing webinars, barrier-free learning offers, virtual and augmented reality in educational work.

Media education topics: Legal basics, barrier-free learning programs, open educational resources, media education in schools, VR and AR in educational work.

Organization/structure: Communication and knowledge management, collaborative tools, webinars.

Marketing and social media: Legal basics, presentation tools, explanatory videos.

1.5.3 1.2.3 Qualification Formats

As part of the project *#ko.vernetzt*, various qualification formats for the promotion of work-related digital competence were developed, which provided need-oriented support for the employees of *Kolping-Bildungswerk Paderborn*.

Workshops and Seminars

Initially, employees were offered workshops as well as 1- and 2-day attendance seminars on various topics, each held in one of the conference hotels of *Kolping-Bildungswerk Paderborn*. The workshops and seminars could be attended independently, and everyone interested could join at any time during the qualification phase of the project. The participants of the seminars received a written confirmation. Altogether 16 face-to-face events, 3 in-depth webinars, and further self-initiated webinars were held. The first three workshops were designed as 1-day introductory or kick-off workshops. One workshop on the topic "Learning Videos" was devoted to getting to know how to create films with a tablet device. The workshop "Learning Platforms" was about the benefits and the possibilities of using these devices in vocational training. A workshop on "Barrier-Free Learning Programs" gave participants the opportunity to learn about the potentials of digital tools for working with heterogeneous and inclusive learning groups. In all the workshops, participants developed an understanding on how to promote media competence in educational work, and they gained more confidence in dealing with digital media. In addition, the first workshops served to build up relationships and determine the needs for qualification measures.

The main qualification series started with the seminar on "Mobile Technologies in Education." There, possibilities of using mobile devices for educational work were taught and tested. In addition, implementation ideas for one's own practice were developed.

Two seminars on "Legal Basics of Educational Programs with a Media Reference" took place in particular to increase confidence in dealing with digital media in an educational context by understanding and becoming acquainted with the most important legal basics, from copyright law to the drafting of declarations of consent.

The participants were able to get to know alternative digital presentation and documentation tools in the seminar on the topic of "Presentation Tools," which was offered twice. Here they also developed and reflected upon application scenarios for their own practice.

In the seminar entitled "Using and Producing Explanatory Videos," the participants developed criteria for using explanatory videos from the Internet and designed their own learning videos. This gave them the opportunity to learn about and apply technical and cinematic language basics and to develop application scenarios in order to reduce individual restraints.

In the seminar on "Collaborative Tools," principles of collaborative working were taught, and suitable digital tools were tested for use in one's own practice.

During the seminar "Designing Webinars," participants were able to get to know software solutions and acquire didactic basics for the implementation of webinars in their own educational practice.

Within the seminar on "Virtual Reality and 360° in Educational Work," the participants were able to get to know different technologies and their possible applications in (vocational) education and training, to test individual tools, and to develop their own ideas.

The main aim of the seminar on "Knowledge Management and Communication" was to develop an understanding of the necessity of knowledge management in an institution. What knowledge is available? Which employees have access to it? How is this knowledge organized? Furthermore, tools for better collaboration and shared access to knowledge were tested and reflected upon.

In response to an urgent request from employees, the seminar on "Moodle in Adult Education" was held twice. Here, employees were given an insight into the learning platform Moodle, which they were able to acquire in theoretical and practical parts. They learned about the possible applications, design, and organization of a Moodle course and reflected on concepts of blended learning as well as questions of copyright and data protection when using Moodle and other learning platforms.

The seminar on "Media Education in Schools" was the conclusion of the qualification series in *#ko.vernetzt. Kolping-Schulwerk Paderborn* had previously dealt with the question of digitization and school education in a presence dialogue with the University of Cologne, purchased equipment, and worked out media concepts for schools. In the seminar participants from the different schools got to know additional application possibilities and deepened the intensive exchange among themselves in order to promote digital learning at their schools in the future.

In-Depth Webinar

The participants of the qualification seminars had the opportunity to deepen or expand already acquired knowledge online. The webinars, which lasted 1 to 2 hours, were geared to the participants' wishes for further training and took place in a secure space for participants only. The in-depth webinars were held on three **t**opics:

- Open Educational Resources: Background and application knowledge for the setting and use of content on the Internet was imparted and tools were presented.

- Flipped Classroom: The participants had the opportunity to get to know the teaching-learning principle and to try out individual tools.
- How to Design Webinars: The participants could test webinars as a format and a tool and exchange ideas on the topic of webinars and possible implementation ideas.

Learning Nuggets
In addition to the actual qualification formats, small learning nuggets such as flyers, postcards, etc. were provided that summarize the contents of the various qualification events in a short, compact, and understandable way. The multipliers should be able to use these to pass on their knowledge to others and to promote the project within their institution. These materials were developed in collaboration with the participants in the qualification seminars in order to make them suitable for the target group and to distribute them. Some challenges arose in the implementation of this element, so that a conceptual adjustment was necessary. In the end, an analogue toolbox was created, which contains individual cards for tools that are also available in digital form on the project website and are continuously expanded. In addition to the toolbox, smaller blogs and articles were created on the project website.

The Webinar Series "Digitization and Society"
For employees of *Kolping-Bildungswerk Paderborn* who are not able to participate in face-to-face seminars and would like to get a general insight into the topic of digitization first, the webinar series "Digitization and Society" should be available. One-hour online-based seminars should take place regularly and should be announced publicly via www.kovernetzt.de. The webinar series should deal with socially relevant topics such as "digital health," "digital communication," or "personal data protection." Instead of a webinar series organized by the project partners, however, a separate webinar series was created on the multipliers' own initiative and with the support of the project team, which is primarily used to exchange information between the multipliers and to discuss media development projects.

1.5.4 1.2.4 Critical Reflection on the Qualification Measures

In developing the qualification program, the orientation toward the needs of potential participants was an essential factor. To enable as many employees as possible to take part in the training measures, time resources and individual needs were considered in addition to desired topics. The planned face-to-face events, webinars, and the project website were also used to provide information.

Participation and Motivation
Depending on the interest, an employee could participate in a single or several events. The seminars were not based on each other. Only the webinars provided in-depth coverage of topics that had already been dealt with in face-to-face sessions. Nevertheless, even these were comprehensible without attending the seminars. The attendance at the seminars and webinars varied. This can be explained on the one hand by the thematic focus and thus also the possible link to one's own professional

practice and on the other hand by organizational conditions. The events were advertised in each case via the management of the respective institutions (as well as the website www.kovernetzt.de). The decision on participation in measures and access to the training program was made at management level. As a result, not only employees from the vocational training field took part in the qualification courses but also administrative staff or employees responsible for public relations. This resulted in a very heterogeneous seminar group in some cases, both in terms of previous knowledge of the topics and in terms of the respective expectations.

For instance, the seminar on "Virtual Reality in Vocational Education and Training" attracted less interested people, as the topic is probably too far away from their own daily workflow. Apparently, there is a lack of imagination on how to use this technology in education. Furthermore, they associate technical hurdles with it – regardless of whether they exist. The low participation in webinars can also be explained by this fear of contact with new technology. It is a setting that many potential participants are unaware of, and it requires a prior examination of the technical implementation.

It proved to be useful that some managers and employees responsible for IT also took part in individual events. They were able to get to know the added value for the educational work and at the same time learn about the needs of their colleagues to implement teaching and learning with digital media. It was also shown that professionals should not be lone fighters in their institutions but needed to be a helpful back-up. In this way, the motivation can be maintained and transferred to the practical educational work in the institutions.

In the course of the project, it became apparent that it is easier to offer an internal certification in the form of simple certificates of participation for each seminar and to refrain from a complex certificate process. For the participants this kind of certificate is a helpful proof of their recently acquired qualification.

Relationship Work and Networking

The seminar size was limited to a maximum of 12 participants, and in some seminars 2 trainers were involved to consider the individual needs of the participants – especially in the practical learning phases. The orientation toward concrete educational practice was generally perceived as helpful and motivating.

Prior knowledge and experience in using digital media in an educational context were contrasted with uncertainty and concerns. Depending on which addressees the participants are dealing with in their everyday educational practice, there are various uncertainties: Can I safely operate tools and use them sensibly so that they also benefit my addressees? Are my addressees fitter in handling digital media? Do certain technologies lead to a higher motivation or rather to a distraction of my addressees? These and similar questions are of concern to education professionals. For this reason, special emphasis was placed on practical relevance in the qualifications. In addition to practical learning phases, space and time was given for the exchange of ideas and collective development of implementation ideas for one's own educational work. Besides the use of digital media for teaching and learning, participants

also have marketing aspects in mind. For instance, they discussed how an online presentation tool could be used to promote the institution or introduce projects.

Flexibility and Open-Mindedness
Especially those who attended more than one event should learn that digitization requires flexibility and open-mindedness. In seminars and webinars, they were able to develop these. Throughout the whole project, it became obvious that most of the participants had a positive attitude toward teaching and learning with and about digital media. It is considered necessary and useful. At the same time, however, there are many participants who were afraid of using them themselves or using them in class. Especially if the use relates to a lot of effort (in preparation), some professionals hesitated to do so.

Those who participated in several qualification events increasingly showed a relaxed and open approach to digital tools. The fear of contact and uncertainties visibly decreased. The feedback showed that the acquired knowledge is increasingly being implemented in everyday work. This is not always happening in direct educational work with addressees, but also takes place in the organization and administration. Digital tools are also taken for granted in the context of seminars or webinars. One seminar developed into an internal webinar series in order to get to know and test the format of online seminars. In this way, the participants wanted to gain confidence in using the necessary technical tools and become acquainted with the unfamiliar learning environment.

1.6 #ko.vernetzt: Digitization from Three Perspectives

The central starting point for the support of the digitization in *Kolping-Bildungswerk Paderborn* was the requirements for educational work caused by digital changes. These requirements range from new ways to organize knowledge management to (media-)didactic innovations as well as internal and external communication. The organization and its educational work are always influenced by new requirements. Flexibility is therefore not only necessary for employees but also for the structures of the organization. From a media educational and media-didactic perspective, the question is always when the use of digital tools is appropriate and when it is not. In the following three perspectives on digitization are presented: the organizational, the employees', and the media educational perspective.

1.6.1 1.3.1 The Organizational Perspective

Requirements caused by the digitization that have an impact on educational organizations require holistic changes in the organization. It is not enough to simply acquire technical equipment and to designate an IT representative that is responsible

for the digitization. Rather, profound changes and sustainable strategic decisions are necessary in the context of digital transformation, media-related organizational culture, and learning-space development (Meister 2005; Stang 2003).

Kolping-Bildungswerk Paderborn served theoretically as an ideal testing field in this context, because its educational programs cover the entire educational biography of a person and because with its interconnected, but centrally managed, structure, it enables overarching change and decision processes and a reflection of those processes. This requires close cooperation between the involved institutions regarding the implementation of processes, tools, and techniques into the existing organizational structure. This cooperation must be anchored in the organizational structure and requires a long period for implementation and therefore long-term support. Thus, it is important to plan and budget sufficient time, financial, and personal resources for processes of digitization and to make these resources available to employees.

For an educational organization, this means a fundamental rethinking of the calculation of offers, new employee profiles, and the associated new qualifications, as well as the rethinking of educational programs. Especially in large educational organizations like *Kolping-Bildungswerk Paderborn*, which are highly differentiated and decentralized on a large scale, it is important to include different groups and their respective expertise in decisions. These groups can include employees in certain educational areas, technically experienced colleagues, or external experts. Managers and employees should always develop ideas and strategies together at eye level. In doing so, ideas and strategies are particularly efficient when they are oriented toward a specific problem or requirement. Only then it is possible to consider all perspectives, those of the respective employees as well as those of addressees, adequately. This way existing experience and knowledge as well as objectives or resistances, which in their entirety decisively shape the organizational culture, can be taken into account.

Openness and transparency in decision-making processes are essential in this context, especially regarding the introduction of new technologies or changed work-related and educational processes. Personal initiative and innovation must be valued and reflected upon, a positive way to deal with errors must be cultivated, and a constructive approach to ideas and criticism must be encouraged. In addition, it is important to provide testing grounds for new technologies. This allows employees to try out digital technologies in practice (Hofhues et al. 2020a, b; Helbig et al. 2020a, b, sc).

The reorganization of knowledge management that comes with the digitization presents a central challenge. In order to make knowledge accessible across departments and hierarchies, physical and digital spaces must be created for informal forms of knowledge transfer as well as specific times for formal knowledge transfer. In a differentiated educational organization, the networking of stakeholders and institutions plays a decisive role in order to bundle individual and collective experiences and to be able to exchange them sustainably and purposefully. Target and implementation strategies should be based on this bundled experience and developed in cooperation with external experts, so that an external view and subject-

specific expertise can be included. The choice of experts depends on the subject of the digitization efforts. They may come from the field of media education when it comes to educational work, competence promotion, or target group-specific approaches. Experts from the field of media didactics can provide support in designing digital learning settings. Marketing experts can promote social media work, and IT consultants can help to shape the technical infrastructure appropriately. Various digital tools can also be used in this context to enable cooperative, collaborative work with external parties (Hofhues et al. 2020a, b; Helbig et al. 2020a, c).

Furthermore, it is important to motivate employees toward further training and to provide enough resources for qualification in the context of digitization. The documentation of the experience and knowledge gained from the qualification is also essential for successful knowledge management. Online documents or Wiki systems are suitable for this purpose, which allow a certain amount of unification and standardization. This way the need to adapt the knowledge for different work areas and target groups is also taken into consideration. Collaborative tools and transparent knowledge databases offer a good approach here (Hofhues et al. 2020b; Helbig et al. 2020a, b, c).

1.6.2 1.3.2 The Employees' Perspective

A sustainable implementation of digital technologies in educational institutions especially depends on the fact that all participants, addressees, employees, and management personnel, with their individual needs, and not the digital technologies, are the focus of attention. Organizational development must always be thought from a human perspective (Hofhues et al. 2020a, b). The support needs of employees and managers are primarily in communication, administration, and teaching.

The advantage of new technical solutions in the field of communication is seen here in particular in the time savings through asynchronous communication. There is a desire for digital technologies for coordination, collaboration, and information gathering. This is also where the possibilities of mobile working are appreciated. Employees also expressed the wish for digital technologies as teaching/learning tools that can be used collaboratively, such as learning videos or learning management systems (Helbig et al. 2020c).

The wishes and needs of employees and their direct involvement in decision-making processes require a changed understanding of leadership and transparency between managers and employees. Transparency and clear communication help to put existing negative experiences into perspective and to reduce reservations (Hofhues et al. 2020a; Helbig et al. 2020b; c). The development of strategies can be based on the resources of employees by letting them work on individual and entrepreneurial needs or problems themselves and by incorporating the results into organizational developments. In this way they would take responsibility for their own development in a protected space, acquire problem-solving competence, and make approaches to solutions transferable.

In order to react to identified competence deficits among employees and addressees related to digital technologies, comprehensive qualifications must aim both at teaching digital technologies and at promoting media competence, problem-solving, and decision-making skills in the context of digitization. In addition to specific abilities and skills, qualifications must enable employees to adopt an attitude that enables them to shape future-oriented educational processes with, and possibly without, digital technologies. In addition, it is important to promote networking among people so that they can share their knowledge and experience and support each other (Helbig et al. 2020a, c). Personal relationships between employees and face-to-face communication are still important. Individual and collective identification with developments is increased by employees qualifying each other. The human factor is of key importance here. This should also be reflected in the mission statement and quality policy of an educational organization. Employee-oriented action means transparency and openness in order to strengthen satisfaction and thus also the identification of employees and to take them along on the way into the digital age.

1.6.3 1.3.3 The Media Educational Perspective

In (vocational) educational institutions, digital transformation requires, among other things, the promotion of media competence appropriate to the addressees, its sustainable anchoring and the implementation of digital media in organizational processes, and thus the work-related digital competence aimed for in *#ko.vernetzt*. Digital media should be used as tools, and their significance in educational processes should be reflected upon, but media competence should not be reduced to technical-functional aspects. *#ko.vernetzt* not only conveys technical possibilities but also initiated reflection processes on media-initiated changes in educational practice, addressed ideas of digital education, and strengthened the employees in their flexibility and ability to cope with everyday demands. Throughout the project, the organizational units of *Kolping-Bildungswerk Paderborn* have thus shown an increased interest in the subject area of digitization. The employees have recognized that digital transformation entails profound and above all long-term changes for the organization. They want to participate in shaping these changes and to be accompanied in doing so.

From a media educational perspective, a central problem arises which becomes particularly clear in the context of vocational training: the normative narrowing of the concept of media competence to economic interests, training, and occupational skills or technical skills. This narrowing ultimately limits the effectiveness of media education offerings to an economic usability that neither is in the true sense of the addressees nor adequately incorporates their perspectives. The promotion of media competence must enable people to lead a confident and self-determined life in a mediatized society. Aspects of personal development and social participation must be given priority over purpose-rational qualification, efficiency, and technical skills.

However, the question is how far central objectives of media competence from a media education perspective – such as a confident way of living, political participation, or a critical approach to media – can be part of work-related media competence promotion. Although the project *#ko.vernetz*t took into account overarching objectives through the approach of a work-related digital competence, the actual promotion was also focused on the qualification for certain fields of work. Only by dealing with digital change and the critical reflection of social changes could central objectives of media education be taken into account.

This means first and foremost promoting the qualification and communication of employees and involving them in development processes. It also requires dialogue between managers, employees, and experts in the various digitization fields. The organizational development that goes hand in hand with this also means a change in culture in order to meet the requirements of a new digital education, which places fundamentally new demands on people in vocational training institutions and their ability to actively participate in the digital transformation process.

The qualification measures have therefore taken up the topic of digitization and an attitude toward developments. Also, in this context certain digital tools brought together knowledge acquisition and capability to act. Familiar ways of communication and working could thus be adapted to the requirements of digitized education, and even skeptics could be motivated to redesign education. In the process, four focal levels at the interface between media education and the digitization of education and educational institutions have emerged, in which the questions and topics of the employees can be found, and which can be identified as central fields of action in the context of digitization:

Level 1: Organization/structure

- Influences in the context of digitization on the structure of the institution/department.
- Influences in the context of digitization on the structure of the entire organization/holding.
- Technical infrastructure and technical access requirements in facilities.
- Digitization in the field of administration and corporate communication (internal and external).
- Tracking of participation in online offers, online evaluation of educational measures.

Level 2: Educational work/pedagogy

- Digital tools for educational work.
- Media didactics, learning settings, new educational spaces in the context of digitization.
- Learning platforms, learning management systems (LMS).
- Inclusion and integration, diversity of content and media (pictures, videos, etc.)
- Technical admission requirements for participants in training measures.

Level 3: Content with media reference

- Social relations in mediatized worlds, media worlds, mediatized living worlds.
- Concepts and topics related to digitization, media ethics, and media education.
- Prevention and protection of minors in the media, risks associated with media.
- Data protection, personal and image rights, personal data.
- Media handling of different target groups/generations, intergenerational media work.

Level 4: Marketing/social media

- Digitization in marketing and public relations.
- Digitized target group approach and target group acquisition online.
- Social media and new forms of communication and expression.
- Target group-specific and life-world-oriented online address.

While levels 2 and 3 explicitly touch on media education, many of the aspects of organizational development (level 1) and social media marketing (level 4) articulated by employees require other disciplines and external experts for professional discourses. A professionalization of media education also requires being aware of this fact and focusing on central media education topics and approaches (see also Schmidt-Hertha and Rohs (2018)).

1.7 An Interim Conclusion: #ko.vernetzt as Pulse Generator

The project-network *#ko.vernetzt* was set up, among other things, to reflect on questions of digitization in dialogue with employees, to link them to positions from science and society, and to feed back insights into the development of educational work and the organization. However, numerous challenges for research and practice arose, which could only be solved to a limited extent. It was not possible to transfer the ideas of local employees and management via the multi-stakeholder dialogues to the extent that would have been desirable. Existing structures seem to be too inflexible, because they are too strongly enshrined in the organizational culture. In addition, dialogue requires transparency and openness, which are understandably less easy to achieve in a holding company than in other education sectors that are less dependent on competition in the education market. There was greater potential in the surveys of the different needs and ideas (see Chap. 3 in this volume), because here empirical results could be collected that are better suited to the argumentation of development processes within the logic of economic exploitation. Nevertheless, a transfer of the findings was possible both in the various dialogue formats and in the context of the qualifications, in presentations of interim results, and in the dialogue between project coordination and project stakeholders. The project *#ko.vernetzt* has thus set clear impulses which – even if outside the actual project work – have promoted processes of digitization of educational work in *Kolping-Bildungswerk*

Paderborn. However, the corresponding processes need a lot of time and a trusting, cooperative collaboration. The degree of independence that the participants are expected to have plays a decisive role in this context. Only if the individual employee is able to follow the individual steps a feeling of "sovereignty" in dealing with digital media can develop. At the same time, this enables employees to be motivated to become actively involved in the digital transformation of the organization. Qualification measures were therefore the more successful, the more precisely the content and methodological approach were tailored to the participants' requirements. Even if only a very small part of the employees of *Kolping-Bildungswerk Paderborn* could be involved during the project duration, those who were qualified will pass on their experiences and integrate them into their daily work and thus arouse the interest of the rest of the employees.

Until the end of the project, various further externally funded projects (separate from *#ko.vernetzt*) and digital transformation processes have been initiated in *Kolping-Bildungswerk Paderborn* and with different cooperation partners. In the inclusion hotels, learning videos were used, individual multipliers started a series of webinars, an inter-institutional working group has come together to develop a social media concept, virtual courses were set up in vocational education, a system for knowledge management was established in *Kolping-Bildungszentren Südwestfalen*, media development plans were drawn up in *Kolping-Schulwerk Paderborn*, and at the holding level, a new consultant position was set up to initiate and carry out further digital projects. All these activities have also been made possible by impulses set in the context of *#ko.vernetzt*.

The project's specific approach and the fact that it is situated between research and practice make recommendations for action possible that will provide the professional discourse with an impetus for a media educational perspective on vocational training in the whole organization. Field reports and reflections will be freely published on www.kovernetzt.de after the end of the project (06/2020). On the one hand, these can contribute to the further development of vocationally oriented media competence promotion and, on the other hand, to new media educational concepts which, in the sense of a broad, value-oriented understanding of education aim at digital empowerment, fulfill the requirements of a new digital education, which places fundamentally new demands on people in vocational training institutions. The involvement of employees in entrepreneurial strategies for digitization plays a central role in this context and promotes their feasibility. These strategies must be carried out by using participative instruments and methods for the media-supported articulation of employee interests. The prospect of promoting one's own skills and projects as well as qualifications appropriate to the target group through close cooperation between employees and experts also promotes a high level of security and a feeling of "sovereignty" in dealing with media and technology and at the same time motivates employees to become actively involved in the transformation of the organization. Better vocational training and continuing education based on future-oriented qualified educational employees can ultimately lead to higher job satisfaction, future viability, flexibility, and efficiency of the target groups in their professional lives.

Acknowledgments This research was funded by the German Federal Ministry of Education and Research from 2017 until 2020 (funding reference number 01PZ16002A-D).

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Chapter 2
Multi-Stakeholder Dialogues as Instrument for Design and Qualitative Research in Educational Organisations

Christian Helbig, Sandra Hofhues, and Bence Lukács

2.1 Introduction

Currently many, if not all, organisations are facing massive and sudden changes to their communication structures and work processes as they grapple with the term *digital transformation* – since it is suddenly becoming an absolute necessity (as we are writing this chapter, the outbreak of the novel coronavirus is turning into a global agenda for society, research and education). One of the main questions that arises during the tackling of these challenges is if organisations are just looking for a quick fix, or if they might be able to turn the corner and introduce sustainable transformative procedures.

The challenges of building and maintaining technical and digital infrastructures have been keeping many organisations on their heels, be it with a focus on manufacturing (i.e. Industry 4.0) or on education (e.g. distance education and open education). A question that mostly remained in the background was that of how people would be able to deal with these new and innovative infrastructures, when they eventually arrive through a deliberate implementation process. But as the current situation we are facing shows, simply providing adequate technical and digital infrastructures does not ease the burden properly. Although the immediate needs can be bridged (i.e. keeping classes going virtually), a sustainable transformation of the attitudes and practices requires specific concepts, methods and an entire thought-out process.

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_2

In public, as well as political discourse, the technical perspective on digital transformation is given relatively much space (e.g. Altenrath et al. 2020). Thus, digital infrastructures are often described as the basis on which digital transformation would succeed. On the one hand, there is a growing consensus in social science that digital transformation has to be understood as a transformation of individual and collective social practices (i.e. Krotz 2009; Lundby 2014) – with an uncertain outcome: Individual and collective action changes educational organisations and organisational environments, as studies on sociotechnical systems (i.e. Avis 2018) or technostress (i.e. Hassan et al. 2019) show. Whether and to what extent organisations develop depends on themselves, i.e. their set goals and their social practice. On the other hand, organisations and their bureaucracies likewise affect society and social practices. In this light it is necessary to look at people in organisations and organisational learning in the context of digital transformation processes empirically and theoretically, e.g. to ask *how an educational organisation with differentiated educational domains deals with digitisation requirements*. In this way we address those transformation processes that are expressed by collectives and their verbalised practices. To this end, we focus in particular on the importance of dialogue formats both for promoting development processes and for researching organisations.

First, we will present and discuss (methodological) definitions of group discussions by differentiating between two major types – mediating and investigative group discussions. Based on these definitions, we explain design dimensions (Chap. 3) and empirical dimensions of dialogue formats in learning organisations (Chap. 4), before we present results from the dialogue formats in the project #ko.vernetzt[1] (Chap. 5). After outlining the results, we finalise the article with a conclusion (Chap. 6). In order to answer our main research question, we will go into more detail about group discussions in the following.

2.2 Double Meaning of Dialogue Formats

If one wishes to study social practice in educational organisations, there are fundamentally different ways of approaching one's own questions from a research perspective. On the organisational level, a wide repertoire of quantitative and qualitative methods in empirical social research can be used. In the following we therefore present our basic assumptions (Sect. 2.2.1), followed by the introduction of two different perspectives on discussion formats (Sects. 2.2.2 and 2.2.3). At the end of the chapter, we introduce the so-called multi-stakeholder dialogues, which conceptually refer to a combination of organisational research and organisational development (Sect. 2.2.4).

[1] #ko.vernetzt was funded from 2017 till 2020 by the Federal Ministry of Education and Research in Germany (funding reference number 01PZ16002A-D).

2.2.1 Framework and Basic Assumptions

If one reflects on the research question, how people approach their challenges in the process of work and what role technology plays in this process, it quickly becomes clear that ways of questioning and observation would be important for clarifying the initial question.

Digitisation, understood as the current surge of mediatisation, is linked to processes of social change – how we communicate and interact with each other (Krotz 2009). These processes of change at all levels of society imply that social science theories about society and social action are only temporarily valid. In our paradigmatic presuppositions, we link to Glaser and Strauss (1969), who emphasise that a theory that may be obsolete, e.g. as a result of social change processes, cannot be refuted by statistical falsification, but by an alternative theory. However, it is not our aim to present an existing theory as outdated, but rather that new readings should enrich theory formation. Accordingly, it is necessary to develop new theories through interpretative and reflective methodologies, e.g. through qualitative research. Furthermore, we are interested in how people interact in an organisation. Here, group discussions have proven to be an appropriate solution for people to talk about their everyday working lives.

For the purposes of the topic, it is important to properly define the term dialogue format. We refer to the international and especially the German discourse on group discussions in empirical research. According to Lamnek (2005, p. 29), the different types of group discussion procedures can be classified according to the respective intention of the findings: In group discussions, which have the goal of collecting information and findings of a content-related nature, or about group dynamic processes, he understands those to be investigative group discussions. Group discussions, which are proposing changes in the behaviour of the respondents, are herein referred to as dialogue formats with a mediating character. Both types are relevant for the reflection of the topic and require more in-depth explanations. Subsequently they are brought together again in the concept of multi-stakeholder dialogues (see Sect. 2.2.4).

This contribution is based on an understanding of research as qualitative research and an understanding of group discussions as interactive-dynamic processes that serve both mediation and investigation.

2.2.2 Mediating Group Discussions

In the first place, dialogic activities in educational research practice refer to the interaction and cooperation of teachers and students in (formal) learning contexts or in peer-to-peer concepts (e.g. Gilles 2016; Webb 2009). According to Gilles (2016), the cooperative classroom is considered a space for dialogic interactions, while Webb (2009) described the promotion of dialogue as a fundamental task of teachers

in classrooms. Focusing on the professional development of teachers, MacPhail et al. (2014) pointed out the importance of learning in communities of practice through cooperation and the exchange of ideas, and Camburn and Han (2017) emphasised the cooperation of teachers as a key element in learning communities.

The Communities of Practice model has received attention, particularly in the context of the discussion on organisational learning (e.g. Argyris and Schön 1978; Wenger 1998). It refers to groups of people who are informally and/or supra-organisationally connected and face similar requirements, i.e. the learning actions in social relationships are in focus (Lave and Wenger 1991). Wenger (1998) characterises communities of practice on the basis of several principles, of which only a few have been selected here:

- Sharing historical roots.
- Having related enterprises.
- Having overlapping styles or discourses.
- Competing for the same resources.
- Specific tools, representation and other artefacts.
- Local lore, shared stories, inside jokes, knowing laughter, jargon and shortcuts to communication as well as the ease of producing new ones[2] (Wenger 1998, p. 125–127).

Learning thus happens as a relationship between individuals who focus on a shared object. Changing market situations made the model relevant for companies and elevated it to a key concept of corporate development. The related concept of learning organisations is therefore also to be understood strategically and is negotiated as a solution for innovation requirements (Faulstich 2013, p. 192). Argyris and Schön (1978) distinguish three levels of organisational learning: firstly *single-learning* (Simple target-means-result comparison, deviations and discrepancies are perceived and corrected. The goals are rigid, while the means are varied.) (Faulstich 2013, p. 193), secondly *double-loop learning* (Dynamic contexts make it necessary to adapt goals. Learning therefore also includes goal checking.) (ibid.) and thirdly *deutero-learning* (Learning achievements, learning experiences and learning conditions are reflected upon with regard to their promoting and hindering aspects. The aim is to improve learning skills and to increase problem-solving potential.) (ibid.). The focus is always on knowledge in organisations, according to which the organisational knowledge base is activated depending on the situation ("cognitive basis"). This type of knowledge is composed of recognised standards, strategies, views and models of the environment, which together form organisational structures. However, the members of the organisation are permanently forced to interpret and reference these structures. Accordingly, organisations are to be understood here as open, social systems, which develop mechanisms through which they generate the required information, which in turn is interpreted by individuals in communication

[2] Among these principles, Wenger (1998) also mentions geographical relationships that seem to become increasingly obsolete in the context of digitisation processes.

and interpretation processes (Faulstich 2013, p. 193). These open and broad definitions of learning organisations offer the opportunity to reflect on organisational change and intervention strategies, such as mediating group discussions. It becomes clear that communities of practice go beyond communication and act together on the basis of shared meaning. Learning is thus understood here as a process of habitualisation in a cultural context (Faulstich 2013, p. 196). In the context of these understandings of communities of practice and learning organisations, mediating group discussions present both rationalisation strategies, opportunities for participation and intervention.

In summary, an understanding of group discussions as "mediating" opens a perspective in which organisational development can be promoted in particular through dialogue formats. In the context of digital transformation, this means that organisational development does not take place through the existence or acquisition of technical infrastructure, but rather through the communities of practice and spaces for dialogue. Similar perspectives on organisational development or organisational design can also be found in approaches such as human-centred design (i.e. Magalhaes 2018).

2.2.3 Investigative Group Discussions

From an empirical perspective, group discussions are used in different contexts since the 1990s. However, methodologically it is necessary to differentiate between interaction-focused and non-interaction-focused surveys. The latter variant particularly includes group methods that do not provide opportunities for interaction (e.g. group interviews) and those that are not initiated by researchers (e.g. natural discussions) (Lamnek 2005). In the following we use the term group discussion exclusively as an interaction-focused method of qualitative social research.

In both the German and international discourse, interaction-focused group discussions are understood as a social interaction space in which discussions between existing groups are generated as naturally and authentically as possible. Since the contributions of the participants refer to common events in the context of their shared life and their shared experience, the views expressed and experiences presented by the other participants could be critically questioned and supplemented. In addition, the existing groups provided a social context in which the attitudes and ideas of the interested persons are formed and developed (Kitzinger 1994). However, the composition of group discussions is not trivial and depends on the research intention. In the Anglo-Saxon discourse on group discussions in particular, the advantages and disadvantages of natural and artificial groups are raised. In both forms of composition in interaction-focused group discussions, however, common characteristics can be identified, which must be weighted differently depending on the research subject (Mäder 2013, p. 26): Group discussions made it possible to get an access to the language, concerns and concepts of the participants. According to Wilkinson (1998a, p. 193), they offer an opportunity "to observe the process of

sensemaking" (ibid.), by investigating how opinions are articulated, modified, negotiated and defended (Kitzinger 1994). A special feature of group discussions is seen in the possibility to analyse the interactive processes of the "co-construction of meaning" (Wilkinson 1998b).

Even though the German-language discourse makes hardly any reference to the international discourse, there are parallel occurrences. The positions of the "Frankfurt Institute for Social Research" in particular are being considered in methodological considerations. Pollock (1955) assumed that opinions on topics of general and public interest do not develop in isolation, but "in constant interaction between the individual and the society" (Pollock 1955, p. 32). Through group discussions, it should be possible to identify partly tabooed and latent opinions. Mangold (1973) went even further and assumed that the articulated statements of members of a group are the product of collective interactions and must therefore be seen exclusively as group opinions. According to Mangold, the group opinion has "in reality already formed among the members of the collective in question" (1973, p. 240) and is merely updated in the group discussion. In recent years, Bohnsack has been linked with the theory formation and empirical reflection of group discussions in Germany. He refers to Pollock and Mangold and assumes that in group discussions collective ascriptions of meaning and significance that exist between representatives of classes or milieus are updated (Bohnsack, 2010).

The previous section has shown that individual statements are not evaluated on the level of what is said; above all, what is said is related to statements of others and, to a certain extent, between the lines various interpretations are explored that result from the given statements. In this process, the interpretation process is usually guided by those passages which have a high density of interactions and metaphors.

2.2.4 Unifying Concept: Multi-Stakeholder Dialogues

For the methodological reflection of the authors, both perspectives on group discussion – the mediating and the investigative group discussion – are equally important and should be methodically combined here. For this purpose, it is necessary to introduce and modify a concept from organisational development: multi-stakeholder dialogues (MSD). The MSD is a dialogue-oriented method for accompanying organisational development processes in a business-economic sense (Seufert 2013). The aim is to bring together representatives from different areas of work, responsibilities as well as hierarchical levels of an organisation, across tasks and hierarchies, and to identify and reflect on both the potential and challenges of innovations and to develop consensus-based solutions for concrete problems (Dodds and Benson 2013).

In this understanding, MSD largely correspond with mediating group discussions (cf. 2.1). In the cross-hierarchical negotiations, however, communicative and conjunctive stocks of knowledge are also raised, which can be empirically collected and evaluated. Although mediating group discussions correspond in many points with the theoretical paradigms of investigative group discussions (e.g. the

self-running nature), it should nevertheless be reflected upon that the context and starting point of the group discussions strongly determine the variant. Accordingly, one variant of group discussions – the mediatory or the investigative – will always dominate (i.e. function as primary), while the other is secondary and becomes a "by-product". This means that in mediating group discussions, the qualitative data are a by-product, since the researchers cannot control the direction of the discussion based on the research interest. The same applies to group discussions that are conducted with an exclusively empirical interest: here, the participating group may experience unintended learning processes. This dilemma cannot be completely resolved, but it can be used productively. In the following, we will attempt to describe "dialogical formats" as design and research method for learning organisations.

2.3 Design Dimensions of Dialogue Formats in Learning Organisations

As has been discussed in the previous chapters, each dialogue format has its own specific methodological groundwork. Additionally, when taking into account the topic or the subject-matter for a group discussion (i.e. digital transformation of an organisation), certain design elements can prove to be more suitable. In the context of the project #ko.vernetzt and the implementation of MSD during the developmental process, much of the design was guided by various models centred around innovation, technological diffusion and science (literacy) communication (Eveland 1986; Rogers 2003; Horst 2008).

The four main principles upon which we conceptualised, organised and implemented our dialogue formats, and which are equally important for design and research, can be described as follows:

(a) *Involvement of all (internal) stakeholders and interest groups:* One of the basic tenets of organisational development (either as a learning organisation generally or through technological implementations specifically) is to involve people from all relevant hierarchical levels and areas of responsibility, since each person has their unique perspective and relationship towards the focus of the implementation (i.e. technology) and their lives (Cochran 1980). This in turn requires hierarchically open structures, or at least the (consciously enabled/designed) opportunity for every stakeholder to (freely) share their opinion and actively partake in the development process itself. Just as corporate stakeholders determine the direction in which an organisation is developing, be it externally in terms of a supplier-customer relationship or internally in terms of organisational development, do front-line workers have to eventually work with the planned implementation while also finding value in it for their own processes. It should be added at this point that the involvement of all stakeholders and interest groups is not accompanied by a general dissolution of hierarchies.

Especially in the investigative perspectives (cf. 4), the existence of power and interpretative sovereignty becomes relevant.

(b) *Multilateral presence dialogues:* MSD at its core presents unique solutions through combining affordances and needs of various theoretical approaches. It is a dialogue-oriented method which can be implemented with or without media (e.g. digital support structures). With the help of cross-task and cross-hierarchical representations, actors of an organisation are to be brought together as stakeholders representing groups at a (round)table and to share and discuss their own perspectives and opinions at eye level. This process can additionally be supported by technological and digital structures, such as enabling the stakeholders to continually provide opinions and ideas, as well as give and receive feedback in between face-to-face sessions (e.g. via an online communication platform). So in our understanding, an MSD is characterised by the fact that it is able to identify and jointly reflect on the potential of organisational development and the challenges of processing technical innovations implicitly.

(c) *Consensus for description of objectives and goals:* Another goal of the MSD is to develop consensus-based solutions, focusing on concrete problems that are developed at the (round)table. This ensures that the key points and concept papers that emerge from the dialogues are accepted by as many interest groups as possible, as they are not top-down or externally dictated by the (research) partners involved. It is therefore key to have transparent communication structures, which is especially important when designing asynchronous parts within a developmental process (i.e. setting up digital channels). Although methodical and design innovations can be implicitly implemented, since the groundwork and the goals have been developed collaboratively and openly, communicating one's intention with regard to certain methodical and design choices needs to be made clear to all participants.

(d) *Dialogue formats as a development and research method:* The duplication of MSD as mediating and investigative group discussion is purposeful for projects between theory and practice, since this ensures that the design project can be systematically recorded and described.

As can be seen in these design dimensions, the most critical aspects of such a process are the central focus on the participants, their needs and ideas (i.e. human-centred design (Magalhaes 2018)), as well as the clear awareness about the iterative nature of the entire dialogue (and development) process (i.e. identifying a problem, creating a solution, testing and improving upon it). These keystones are mostly discussed through the term "design thinking" (Brown 2008) or co-creation within computer science. In our case, dialogue formats represent a conceptual and methodological cross-section by representing the process itself, in addition to functioning as a possible (driver towards a) solution (i.e. iteratively and implicitly changing the work, thinking and communication processes in an organisation).

2.4 Empirical Dimensions of Dialogue Formats

In the perspective of investigative group discussions, as it has been presented here so far (cf. 2.2), empirical dimensions come into focus, which aim at interactive processes in groups and collective experiences. Even though there are various type of approaches to the evaluation of qualitative data, e.g. grounded theory (Glaser and Strauss 1967) or qualitative content analysis (Mayring 2014), the perspective of the "documentary method" (in German "Dokumentarische Methode") is added here. The documentary method can be traced back to Garfinkel (1961) and Mannheim (1964, 1980) and was significantly further developed in Germany by Bohnsack (i.e. 2010). The method has already been tested in the context of various research subjects and fields, including school and classroom research; childhood, youth and family research; media and reception research; and professionalisation research (Nohl 2020). Recently, methodological considerations on "documentary organisational research" (Amling and Vogd 2017) were published, which can also be used for research questions on the digital transformation of learning organisations.

The central distinction in the documentary method concerns the two levels of pragmatic knowledge according to Mannheim (1980): communicative knowledge and conjunctive knowledge. The communicative knowledge in an utterance is expressed in the explicit meaning contained in the objectivised (linguistic, iconic and performative) means of expression. It contains the interpretations of the actors about their own praxis, but the observer does not gain insight here into the praxis itself. Communicative knowledge remains at the level of theorising about praxis and, as common sense theoretical knowledge, the knowledge about the activity. With the documentary method, Bohnsack proposes a methodical procedure in the interpretative paradigm of empirical social research, with the help of which the conjunctive knowledge behind the communicative knowledge is to be made visible. According to this, the statements of the group members are connected through "collective frameworks of orientations", which develop in the same way in different groups consisting of members of the same classes or milieus. This also makes it clear which specific characteristics, according to Bohnsack et al. (2010), can form a collection of people into a group: they share common experiences, possibly without knowing each other personally.

Against this theoretical background, the importance of looking at organisations and – in the sense of this anthology – to raise questions about their digital transformation becomes apparent. As Amling and Vogd (2017, p. 16) point out, the basic theoretical references of the documentary method suggest that research-practical selected groups Dialogue formats: may well be equated with milieus. However, organisations are often characterised by the fact that there are heterogeneous, divergent and conflicting milieu contexts. These different value orientations are, for example, dependent on hierarchies and professional socialisation. As a consequence, guidelines, rules and instructions can appear as external frameworks in organisations. In terms of research methodology, this means that both common collective frameworks of orientations and their respective organisational units must be

reconstructed as well as the divergent frameworks of orientations and their processing in everyday work. To address this methodological challenge, Nohl (2013) and Mensching (2008) refer to Ortmann (2003) and his perspective on rules. Consequently, the processing of formal rules in organisations results in informal rules, which are understood as regularities of practice. Organisational milieus thus arise when a pool of informal rules is collectively shared by a group. Organisational research structured according to this principle can enable sociological type formation (Nohl 2013, 2017). Here, however, the limits of documentary organisational research become evident, since actions outside of collective structures are excluded and organisations cannot be analysed completely. With regard to digital transformation processes, however, research questions aimed at collective experiences, frameworks of orientations and practices in dealing with the implementation of digital technologies in learning organisations can be addressed.

2.5 Results from the Dialogue Formats in the Project #ko. vernetzt

In the project "multi-stakeholder dialogue and qualitative evaluation" at the University of Cologne, which was conducted within the context of #ko.vernetzt (cf. Bröckling et al. this volume), mediating and investigative dialog formats were tested simultaneously. Thus the aim was both to initiate developmental processes in a learning organisation and to generate empirical results. Hence it was a challenge to create a balance between primary and secondary objectives (cf. Sect. 2.2.3). Due to the application-oriented approach, which was central to the entire project #ko.vernetzt, the focus was on the mediating aspects, while the investigative/empirical perspectives were a by-product. Nevertheless, there have been constant attempts to strengthen empirical positions and to understand research results as opportunities for organisational development as well (although this is always accompanied by simplification). The research perspective focuses on the question of how an educational organisation with differentiated educational domains deals with digitisation requirements.

2.5.1 Description of the Study

Over a period of 3 years, a total of nine dialogues were conducted with stakeholders of departments of an educational organisation.[3] Between 5 and 12 employees and managers from all areas of the organisation (e.g. adult educators, teachers,

[3] #ko.vernetzt was conducted with a specific practice partner. In the course of the project, the preliminary assumption that several cases can be found in a networked organisation was refuted. In

administration, case management) took part in each dialogue. Accordingly, the participants in the discussion are to be understood as quasi-real groups sharing conjunctive knowledge and experience through the organisational context (Kitzinger 1994). The resulting protocols and research results as well as subsequent recommendations were forwarded to the management as quickly as possible. Due to the application-orientation of the project, the topics of the dialogues were developed in an initial dialogue or – in the sense of the methodological framework – worked out based on the communicative knowledge raised in the discussion between the participants. The framework of the initial dialogue, which was set by the researchers, was limited only by the focus on digital transformation in the educational organisation. Due to the character limitation, results can only be presented here in a cursory manner, which lastly leads to summarising considerations.

The issues raised in the interaction between the individuals of the initial dialogue already provided indications of the organisational culture in the context of digital technologies. The following examples are representative for the issues mentioned: "digital teaching", "digital knowledge management", "digital organisation of work" and "digital literacy". In the double meaning of group discussion described in the introduction, these issues are to be understood both as topics of organisational development and as a research focus. The issues raised have not only been discussed since the term digitisation received its current attributions of relevance but also since the emergence of technical infrastructures in organisations (e.g. Wellmann et al. 1996). This is not intended to pursue the narrative that educational organisations are "lagging behind" but rather that traditional challenges in educational organisations are reproduced and reinforced by digitisation. At the same time, these deficits often become visible and workable through the digital transformation that appears as environmental expectations in educational organisations. A systematic look at group discussions that followed the initial dialogue and focused on the issues mentioned provides further indications of practices in the context of digital transformation and the collective framework of the organisation. Against the background of the limited number of cases, a typification of the organisation should be viewed critically. Nevertheless, we dare to make a preliminary description, which therefore requires further concretisation and validation through research. For this purpose, theoretical contrasts have been developed for each of the following dimensions, which we consider realistic and which can characterise other educational organisations in different ways.

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the context of #ko.vernetzt, the organisational hierarchy had such a homogenising effect (cf. Section 2.5.4) that the practice partner could only be understood as one case. Due to the project context, no further cases could be included, so that the typical comparison of minimum and maximum contrasts had to be renounced. The results are therefore to be understood as "dimensions" of organisational communicative and conjunctive knowledge. The particularities of the individual case cannot be worked out without a comparison with other cases.

2.5.2 *Individualisation of Digitisation*

In the group discussions, both external and self-attributions of individual responsibilities in the context of digital transformation processes can be seen repeatedly. These are documented in discussions that are promoted by both managers and employees and end in conclusion.[4] These individualised practices are framed in particular by discussions about technical purchases and professional training. Decisions on technical purchases and infrastructure are decentralised and are made individually in the various departments of the organisation. As a result, technological resources are unequally distributed within the organisation, and their potential – through equally decentralised communication channels – remains unused. This is also linked to the self-attribution of responsibilities for professional qualification: While few departments in the organisation have experience with "new" technologies[5] and as a result individual employees develop qualification needs for themselves, uncertainty and resistance grows among employees with less access to technologies.

This individualisation of the technical infrastructures also reinforces the already prevailing practice of treating the acquisition of new knowledge as individualised. In the group discussions, participation in further training measures in connection with digital technologies is made dependent on individual interests, previous experience and the willingness to acquire qualifications. Although this increases the reputation of technology-experienced employees, e.g. digital teaching becomes more difficult without their support, they are also described as "technology freaks", which increases the individualisation of digitisation.

On the level of the organisation or the departments, the individualisation of digitisation presents itself as a twofold challenge: On the one hand, superordinate implementations of digital structures, e.g. new software, are made more difficult because individual employees have no previous long-term experience with technologies and are not reached through qualifications or training. On the other hand, the resources for enabling organisation-wide qualifications and training are limited, particularly in the education sector.

A theoretical maximum contrast to this collective framework can be seen as centralised and generalised practices of digitisation. Consequently decisions on the acquisition of technologies are made centrally, and qualifications are offered on a mandatory basis to all employees. It is also conceivable that there could be a more democratic collective framework in which as many stakeholders as possible are

[4] The reconstruction of the organization of discourse thus plays a central role in the documentary method. In order to be able to work out the framework of a passage of conversation, it is examined "how" the participants interact with each other. A conclusion describes the end of a discussion in an inclusive mode. According to this, orientations are found in these discussions that are jointly produced by the collective (Przyborski 2004, p. 96).

[5] The description of technologies as *new* is to be understood here as *new* acquisitions in the organisation and as potentially *new* experiences for individuals.

involved in organisational decision-making processes relating to digital transformation processes.

2.5.3 Technology-Driven Digitisation

Another recurring pattern that could be reconstructed in the group discussions is an understanding of digitisation that is attached to technical developments. As already mentioned, references to this collective framework can already be found in the (communicative) issues chosen by the participants themselves: Issues such as knowledge management and (media) didactics are not fundamentally renewed by digital technologies. Instead, existing concepts, attitudes and practices are updated or questioned. The reconstruction of the understanding of digitisation in an organisation thus provides less information on the state of digitisation but more on the collective handling of change processes (Helbig and Lukács 2019).

The technology-driven understanding of digitisation, which was worked out here as a collective framework, is documented in group discussions in the way changes within the organisation are described. For example, new software implementations are often not decided on the basis of added value for employees or addressees, but primarily on the basis of environmental expectations and economic factors. Anchor examples in the group discussions that reflect these frameworks document practices where technologies have been acquired because they are described as new and innovative or practices where the implementation of new technologies alone is expected to add value to organisational processes. The discussions in which these practices are documented are not shared equally by all stakeholders – which is often represented in ritual conclusions[6] – but they document aspects of a technical understanding of digitisation in the organisation, especially when decision-makers represent these practices.

In the context of #ko.vernetzt, this collective framework also became visible in the initiation of organisational development processes, making the double meaning of dialogue procedures described above explicit. In the course of the project, the practice partner criticised the scientific partner that recommendations were too general and heavily focused on cultural aspects of the organisation and very little on the technical infrastructure. The technology focus as a collective frame of orientation is embedded in this criticism, and the organisation demands its reproduction through recommendations.

A theoretical maximum contrast to a technical understanding of digitisation can be a cultural understanding of digitisation. In this understanding, the focus is not on technologies but on everyday practices that are changing due to social change (Krotz 2009). Stalder (2016) offers a perspective on a "culture of digitality", which is

[6] A ritual conclusion describes that topics are concluded without reference to the topics themselves. Consequently, a discussion exists in an excluding mode. Accordingly, different and sometimes irreconcilable orientations are expressed in these discussions (Przyborski 2004, p. 216).

characterised by referentiality, communality and algorithmicity. This also develops the possibility that private and professional modes of action are moving closer together, as they are not bound to a software, an application or devices.

2.5.4 Rigid Organisational Culture

The third dimension of this collective framework relates specifically to practices of change in the organisation. This dimension makes particularly evident the methodological separation of communicative and conjunctive knowledge in the documentary method. Thus the cooperation between science and practice partners came about particularly against the background of pressure for change in the educational organisation. On the communicative level, this environmental pressure was translated into an extrinsic motivation to incorporate the social change of digitisation into the structures and practices of the organisation. In the systematic evaluation of the qualitative data as well as in the documentation of organisational development processes, the contradiction between the formal structure and the inner life of the organisation, as is in principle assumed in documentary organisational research (Vogt 2006), became apparent.

In the group discussions with managers in particular, the need for change was discussed, especially at the level of individual qualifications and the acquisition of new technologies (cf. 5.1; 5.2). These topics were also found in the discussions with skilled workers, who criticised above all outdated or missing technologies in everyday working life. Although the need for modern equipment in educational organisations is undisputed, a collective framework for the practice of organisational development, which can be described as "rigid", is revealed here. The focus is primarily on change processes that can be implemented without resistance from the formal structure of the organisation and those affected.[7] Deeper aspects of organisational culture, such as communication structures, task distribution and allocation of competences, are excluded. A representative quote for this form of organisational culture is "it has always worked this way". According to this, practices from the past are still being implemented, even if the current structures irritate these practices. Organisational development is therefore only superficial, while the organisational culture remains rigid.

An example for a theoretical contrast of this framework is embedded in the discourse on "digital leadership". Leadership is understood in contrast to management, which, for example, focuses on higher and long-term goals instead of short- and medium-term ones, promotes people instead of assigning tasks and develops sustainable strategies instead of maintaining the status quo (Sheninger 2019).

[7] Here, perspectives of neo-institutionalism can be linked (e.g. Meyer and Rowan 1977).

2.6 Conclusion

The article started with a reflection on the general transformation process in organisations, which is discussed in the ongoing process of digitisation. It remains to be seen, or rather an empirical question, whether the current corona pandemic, which is affecting educational organisations in particular, will drive digitisation forwards. As shown in this article, dialogue formats understood as group discussions can offer opportunities to promote developments in the context of digital transformation and generate empirical results. The conclusiveness of our experiences with group discussions in organisational development and research to international discourses is still to be discussed, especially against the background of strong paradigmatic and methodological assumptions. In addition, we were concerned with different and interdisciplinary connections – be it in terms of the benefits that empirical research generates in and for society and for organisations, or be it in terms of the results that a project exemplarily produces in relation to organisational research there with close links to digitisation:

The first point picks up on previous discussions about the usefulness of empirical research, such as the articles in the volume "Der Nutzen wird vertagt" (The benefit is postponed) by Reinmann and Kahlert (2007). In their volume numerous educational scientists have already addressed the question of the extent to which educational science itself can both meet scientific criteria and generate practical added value. The focus is also on expected benefits (i.e. Hug et al. 2007). They are often highlighted as (external) environmental expectations in educational organisational research. However, less consideration is given to where these environmental expectations come from. Instead, they refer back to the legitimatory dimension of organisational action (see Altenrath et al. 2020).

Reflecting secondly on strengths and weaknesses of individual methods and aspects for their combination belongs in an article on group discussions, similarly to an empirical method. For application-oriented projects and concepts, there is no doubt that empirical research methods must be used with caution here. This means that not every method is used in research practice and that research methods are not an end in themselves, especially from an application-oriented perspective. As we have shown in our introduction to group discussions, we would like to emphasise that in our comprehension group, discussions are not just focus groups as they are often used in the area of marketing for the purpose of improving individual products. Although group discussions serve the purpose of verbalisation, their empirical content consists mainly of the interpretation, which lies between what is said and the action itself.

From our empirical example, it can thirdly be deduced that – although there is no doubt that a digital transformation process is taking place in educational organisations – this process makes (non-digital) structural deficits transparent and reinforces them. It even condenses the already existing problems in organisations. In dialogue formats carried out in different educational contexts, digitisation is presented – independent of social or scientific discourse – as a metaphor that serves organisational

members to describe challenges in action processes, communication and working conditions.

For this reason too, further thought would have to be given to what role participation in research might play. In the near future, it should be considered whether participation means and enables actual participation, or whether existing power relations are reinforced by participation, i.e. whether they are being concealed. At least these are considerations that can be derived from a linked project of #ko.vernetzt: OERlabs (Hofhues and Schiefner-Rohs 2020). According to Reichenbach (2006), participation in research and/or organisational development would continue here and reproduce rather traditional lines. Whether this is precisely what is intended with an instrument such as the MSD remains to be determined in future projects.

Acknowledgements This research was funded by the German Federal Ministry of Education and Research from 2017 until 2020 (funding reference number 01PZ16002A-D). We would like to thank the praxis partner for enabling on-site research and all other people involved in the project for their cooperation and participation.

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Chapter 3
Tracing Digital Transformation in Educational Organizations

From Individual to Organizational Perspectives

Marc Egloffstein and Dirk Ifenthaler

3.1 Introduction

The dissemination of digital technologies causes profound changes in the education sector. For professional teaching and learning, digitalization phenomena like the substitution of jobs and occupations through technology (Dengler and Matthes 2018), the rapid evolution of occupational profiles and job descriptions (Conein and Schad-Dankwart 2019), and digital workplace learning (Harteis 2019; Ifenthaler 2018) are gaining more and more importance. Teachers, trainers, and pedagogical professionals not only need to embrace digital technology as a powerful tool for administration and communication but also as a meaningful asset for teaching and learning. Digital technology shapes knowledge and, quite often, is a subject to teaching and learning in itself (Gibson and Ifenthaler 2018). Current models of media competencies for pedagogical professionals reflect those aspects, be it for trainers in adult and continuing education (Rohs et al. 2019), teachers in vocational schools (Seufert et al. 2019), or company-based training personnel (Breiter et al. 2018).

Likewise, digital transformation is now regarded as critical and relevant to the survival of organizations of all kinds (Kenney et al. 2015). Educational organizations, however, do not seem sufficiently well prepared for the challenges of digitalization, often struggling with bad infrastructure or staff shortages (Bernhard-Skala 2019). The few existing models of technology integration in educational organiza-

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_3

tions predominantly focus on school settings as well as on individual factors explaining the assimilation process (Niederhauser and Lindstrom 2018). Still, organizational perspectives on digitalization especially in the education sector are scarce (Ifenthaler and Egloffstein 2020). Within most organizations, the initial phase of a digitalization process – the "fuzzy front end" – is perceived as ill-defined and chaotic (Berghaus and Back 2017). This makes it all the more important to determine a common status or starting point from which the transformation process can be controlled or – at least – supported. If interventions or measures are then undertaken with respect to digitalization, it must be clear what criteria will then be used to decide on success or failure.

In this chapter, we illustrate a systematic approach for supporting the digital transformation of a large educational organization in a joint research project in Germany. After a short description of the research context, we follow a case study approach and outline a maturity model of technology adoption for educational organizations that served as a baseline for training and organizational development. Then, we describe the evaluation concept of a professional development program that focused on individual and organizational aspects of digitalization.

3.2 Research Background

3.2.1 The Joint Research Project #ko.vernetzt

#ko.vernetzt is a joint research and development project for the promotion of digital media competence and media education in the field of vocational education and training (VET). The Institute Youth Film Television Berlin-Brandenburg e.V. (short: JFF-BB) is responsible for the coordination of the research network and project management. Further partners in the network are the University of Cologne, the University of Mannheim, and the Kolping-Bildungswerk Paderborn gGmbH (short: KBW). Coming from diverse research backgrounds, these members constitute a multi-perspective research network for dealing with the overall project challenge: the implementation and supporting of digital transformation processes in a networked educational organization from the field of VET. Direct project goals at KBW are:

- Development and dissemination of an organization-wide understanding of digitalization processes within an educational institution.
- Development and implementation of demand-oriented qualification modules to promote professional media competencies.
- Organizational implementation of media development projects.

The scientific objectives point beyond the field of practice:

- Development and testing of a heuristic for dialogue-oriented organizational development in the context of digitalization (Hofhues et al. 2018).

- Development of a generic maturity model of digitalization for educational institutions (Ifenthaler and Egloffstein 2020).
- Transfer of the findings to other companies in the education sector and beyond.

The joint research project is divided into three project strands with different responsibilities between the partners in the network: qualification, organizational development, and evaluation.

3.2.2 Research Context: Kolping-Bildungswerk Paderborn

The KBW represents a complex field for the implementation of measures of digitalization and application-oriented research. As a holding organization, the Bildungswerk is operating in various locations with 25 subsidiary organizations. With over 5000 participants daily, it is one of the largest providers of vocational education and training and adult education in the state of North Rhine-Westphalia. In 2018–2019, around 2000 employees generated a turnover of approx. 88 million euros. Following the motto "Education with value," the activities of the KBW cover a large part of the education chain. The 11 business areas of the KBW are adult education/vocational further training, securing skilled workers, education consulting, training and occupation, school, inclusion, internationalization, work with refugees, child and youth welfare, nursing and care services, as well as vocational rehabilitation.

With respect to these diverse business segments, multi-professional teams with heterogeneous target groups often work at the KBW on non-standardizable tasks. Different and sometimes ambivalent approaches to digital technologies result in a non-uniform understanding of digital transformation processes and diverging requirements for media-related educational work. The KBW thus exemplifies the diverse challenges VET providers are facing in the light of the digital transformation. On this basis, the approaches and experiences from #ko.vernetzt are to be tested for transferability and made available to other VET providers within and beyond the field.

Professional development and staff training at the KBW have traditionally been organized on a decentralized basis. It is only since 2017 that a central unit has systematically established a holding-wide training program. To this end, requirements from external stakeholders such as the Job Centre are taken up and translated into training courses, which are then usually carried out by external trainers. The focus of the courses for the first half of 2020 has been on prevention. Special courses such as the additional qualification in rehabilitation pedagogy will continue to be organized by the subsidiaries on their own responsibility. Digital media-related training is currently limited to introductory and advanced courses on the spreadsheet software MS Excel (tool training), as requested by the participants. Employees need to apply for participating in further training measures and seek approval by their respective superiors.

Hence, it seems obvious that any structured support for implementation of digitalization processes within the KBW needs an exploration of the field at first. It was necessary to assess the current state of digitalization for being able to set up, implement, and support adequate measures.

3.3 Tracing the State of Digitalization: Development and Application of a Maturity Model

3.3.1 Background and Rationale

In order to trace the state of digitalization within KBW, a maturity model of technology adoption in educational organizations (MMEO) was developed and applied (Ifenthaler and Egloffstein 2020). Maturity models are an "established means to identify strengths and weaknesses of certain domains of an organization" (Lahrmann and Marx 2010, p. 522) that serve to identify discrepancies between the actual and the intended organizational designs which subsequently can be overcome by development activities. "Digital maturity," thus, is understood as the state of an organization's digital transformation, that is, what the organization has already achieved in terms of performing transformation efforts (Chanias and Hess 2016). The goal of MMEO was to get an overview of existing individual competencies and organizational capabilities with regard to the digital transformation. In line with current, comparable approaches (Gramß 2020), the model was developed from a synopsis of six maturity models as a hierarchical model with six specific dimensions. The approach is mainly quantitative, allowing for a scoring on five maturity levels with the following descriptors: digitally minimalist (0–30 points), digitally conservative (31–50 points), digitally pragmatist (51–70 points), digitally advanced (71–90 points), and digitally trailblazing (91–100 points). Table 3.1 provides an overview of the maturity model of technology adoption for educational organizations, its dimensions, and respective indicators.

3.3.2 Operationalization

The MMEO model dimensions (see Table 3.1) were operationalized and administered in a quantitative survey on digital transformation among the employees of KBW. This digital transformation survey covered five areas: conceptions of digitalization (eight items), use of information technology (IT) and digital media (ten items), evaluation of IT and digital media (two items), digitalization in job-related contexts (eight items), and general attitudes toward digitalization (seven items). Most items were answered on a six-point Likert scale.

Table 3.1 Dimensions of the maturity model for educational organizations (MMOE)

Dimension	Indicators/content
Equipment and technology	Equipment with digital devices, software. Up-to-date infrastructure. Homogeneous technology landscape, standards.
Strategy and leadership	Existence and implementation of a digital strategy. Managers promote digitalization with priority. Analysis of new technologies. Democratic leadership style, creative freedom granted.
Organization	Sufficient financial resources. Technical support (internal vs. external service providers). Efficient procurement and maintenance. Pedagogical support.
Employees	Knowledge/skills in dealing with digital technologies. Usage of devices and services. Attitudes. Readiness for further training.
Culture	Openness to new technologies. Openness for change. Open communication, mutual support.
Digital learning and teaching	Digital platforms, e-learning offerings. Working with digital devices in classroom settings. Digital education as an overall goal. Data-driven teaching and learning.

The study was conducted between June and August 2018. In total, $N = 222$ employees (58% female, 34% male, 8% n/a) participated in the two waves using the digital transformation survey. The first wave was administered online, and the second wave as a paper-and-pencil survey to reach additional employee groups. More than half of the participants were involved in teaching, while 30% worked in a leadership position. Participants' work experience ranged from 1 to 46 years, with an average of 18.5 years. In the application of the MMEO, the following questions were addressed:

- How do employees use IT and digital media, and is there a difference between private and job-related usage?
- What are employees' attitudes toward work-related aspects of digitalization?
- What is the maturity level of technology adoption within the educational organization?

3.4 Results

With regard to the use of IT and digital media, participants were asked to differentiate between the private and the professional contexts. As highlighted in Fig. 3.1, there are highly significant differences between private and job-related usage for all

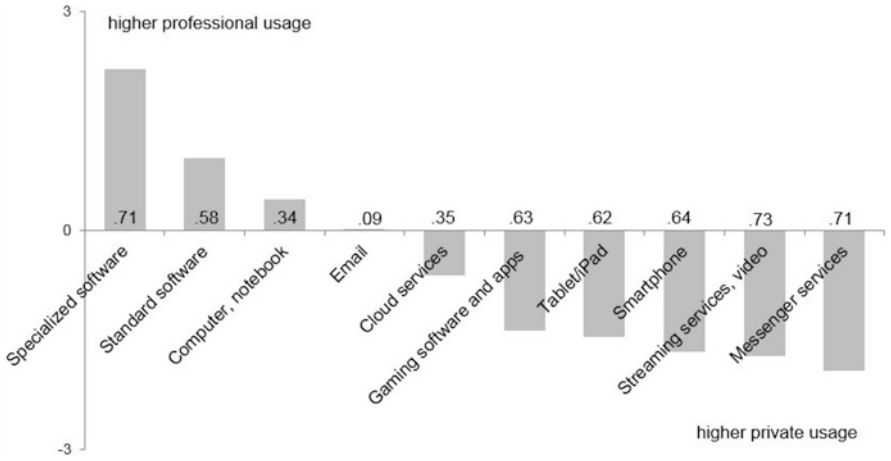

Fig. 3.1 Professional vs. private us of digital media and IT (Δ M, Cohen's d; 208 < n < 215)

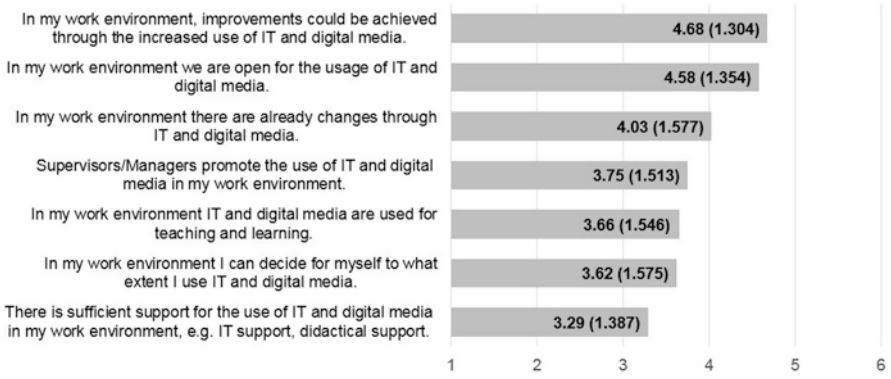

Fig. 3.2 Digitalization in work-related contexts (M / SD; 184 < n < 201)

the technologies and tools with medium to high effect sizes, except for "email." The use of conventional media seems to dominate within the professional context.

Findings focusing on attitudes toward digitalization in job-related context are shown in Fig. 3.2. Participants report that IT and digital media already introduced changes in the work environment and that a further integration of IT and digital media could help to achieve further improvements of the work environment. However, participants also report issues with regard to support for technology integration, less autonomy in IT and digital media use, as well as a lack of IT and digital media for learning and teaching purposes (see Fig. 3.2).

In order to determine the maturity level of technology adoption with KBW, the maturity level of technology adoption for each dimension was calculated. After a weighting of the dimensions, the overall maturity score of technology adoption was determined, and the semantic label for the maturity level was assigned.

Table 3.2 Subscores in the MMEO dimensions and maturity score

Dimension	n^a	*M (SD)*
Employees	209	62.11 (13.63)
Knowledge	215	59.19 (20.01)
Usage	215	56.66 (14.35)
Attitude	215	69.75 (18.64)
Equipment and technology	218	58.30 (22.13)
Strategy and leadership	190	53.42 (26.09)
Organization	199	45.73 (27.73)
Culture	209	70.87 (19.73)
Digital learning and teaching	196	53.16 (30.92)
Maturity score	**167**	**59.51 (14.50)**

Note: [a]Deviations in the sample size *n* result from the evaluation procedure which provides for a minimum of answered items per dimension

As shown in Table 3.2, the highest subscore was calculated for the dimension culture, and the lowest subscore was calculated for the dimension organization. With an overall maturity score of 59.51, the educational organization is classified on maturity level 3, labelled as "digitally pragmatist."

3.4.1 Discussion

Results reveal an average level of digital maturity among the employees surveyed, so that the organization as a whole can be classified as "digitally pragmatist" (Ifenthaler and Egloffstein 2020). However, there is still considerable space for improvement. While employees appear to be open-minded about digitalization, there is a clear need of support for the use of IT and digital media. Likewise, the scope for decision-making concerning IT adoption as well as management commitment and support could be improved. Concerning the use of IT and digital media in professional and private contexts, the results of the digital transformation survey show that it's mostly traditional tools being used at work. Video, for example, which is gaining more and more importance in educational contexts (Poquet et al. 2018), and messaging services including enterprise social networks remain largely underrepresented (Ifenthaler 2018). Here, the operationalization of MMEO in KBW points toward a clear demand for technology-oriented qualification modules in the professional development program.

MMEO provides a static picture of the state of digitalization within an educational organization. As such, it can be compared to the environmental analysis as carried out in human performance technology models (Foshay et al. 2014). Together with a more dynamic perspective as derived from an organizational development process (see, e.g., Helbig, Hofhues, & Lukács in this volume), this picture can provide various reference points for curriculum, program, and intervention design

(Gosper and Ifenthaler 2014). MMEO can be the starting point for internal benchmarks, between employee groups and organizational units, helping uncover blind spots and areas of improvement. MMEO can also be used for benchmark comparisons between different organizations, and, of course, for tracing dynamic developments over longer periods of time, when used iteratively.

However, in its present form, the model still has some drawbacks. The operationalization and implementation are complex and should thus be facilitated. Furthermore, there is an overemphasis on the employee dimension that also increases complexity. Future applications of the model should aim to balance the dimensions by, for example, better integrating the strategy and leadership and the culture dimension. A complimentary survey among managers and executives could provide additional insights here.

3.5 Tracing Developments in the Field of Digitalization: A Multi-Perspective Evaluation of a Professional Development Program

3.5.1 Background and Rationale

Qualification is the central strand of the #ko.vernetzt project. Starting from the level of digital maturity as assessed with MMEO, professional development in #ko.vernetzt is implemented through the qualification series "digital education with value" by JFF-BB (see Bröckling, Behr, and Erdmann in this volume), which has been the main instrument to support and develop digital transformation activities within the regarded context. Organizational development processes were being triggered as direct and indirect effects of this program with the help of special contact persons, the so-called disseminators. In order to trace the individual and organizational outcomes of the program, for accountability reasons, and to fulfil the overall scientific requirements, an adaptive, multi-perspective evaluation concept with four segments has been put into practice. Thus, the evaluation not only focuses on short-term effects but also on long-term outcomes, and it tries to integrate the individual and the organizational perspective. Figure 3.3 illustrates the target concepts and the respective instruments for the four segments of the #ko.vernetzt evaluation concept.

The evaluation was implemented as an external evaluation within the project network. The University of Mannheim acted as third-party evaluator to the professional development program, and neither KBW nor JFF-BB were involved in data collection, analysis, and reporting. As the program was open to anybody interested in the topics with a complete freedom of choice concerning modules or starting points, an adaptive pre-post-evaluation design had to be implemented. The evalua-

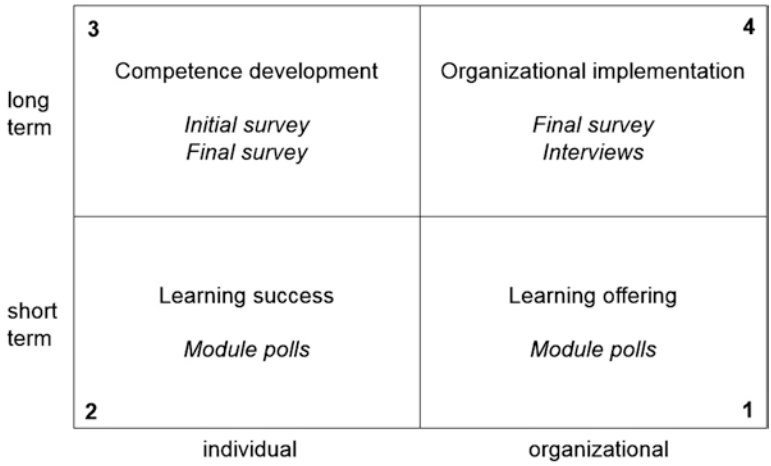

Fig. 3.3 Four-segment evaluation concept

tion consists of an initial pre-series survey that every "first-timer" was asked to fill out before his/her first module, and a final survey that will be implemented several weeks after the program has ended. In between, every participant was asked to fill out a module poll for every module attended. So the number of module polls per participant can vary between 1 and 12 at maximum. Furthermore, participation in the evaluation was not compulsory. Likewise, participants were kindly asked to assign themselves a unique code for data coupling purposes, which also worked on a completely voluntary basis.

With regard to the widespread "Four-Level Evaluation Model" (Kirkpatrick and Kirkpatrick 2006), the short-term effects in segments 1 and 2 can be attributed to the reaction and the learning level. Long-term competence development in segment 3 also applies to learning. The organizational effects in segment 4 would manifest on the behavior level. The business level from Kirkpatrick's model is not addressed in the evaluation concept at hand, as it is not possible to calculate the monetary outcomes of the professional development program. Although the basic assumption of causality within the "Four-Level Evaluation Model" has been widely challenged (Gessler and Sebe-Opfermann 2011), the evaluation concept in #ko.vernetzt still follows the idea that perceived learning success can lead to long-term competence development and to a further implementation of digital technology on the organizational level. With regard to the CIPP evaluation model (context, input, process, product) by Stufflebeam (2003), the evaluation concept addresses learning products as well as the learning process, as the module polls were being iterated over a longer period of time. There was no need to explicitly address context or input aspects, as the inputs of the program (e.g., the topics of the modules) were jointly developed with the learners in a participatory approach (see Bröckling, Behr, and Erdmann, in this volume).

3.5.2 Operationalization

The initial survey covered three areas: motives for participation (five items), "digital" self-efficacy (eight items), and personal and professional background (five items). The items for digital self-efficacy were derived from psychometrically validated instruments on professional self-efficacy (Schyns and von Collani 2014) and uncertainty tolerance (Dalbert 2002) and adapted to the context of working with digital media and IT. Except for the socio-demographics, all items were scored on a 6-point Likert scale. The paper-and-pencil survey was handed out to every new participant at the beginning of each module of the qualification series between fall 2017 and early 2020.

The module polls consisted of four areas: self-assessment of competence (five items) following the "Evaluation in Higher Education: Self-Assessed Competences" (HEsaCom) instrument (Braun and Leidner 2009), emotional-motivational reactions (four items), assessment of the instructional quality, and the quality of learning (nine items) and I like/I wish (two items) and overall rating (one item). The items were answered on a 6-point Likert scale, except for I like/I wish (open format) and the overall verdict (German school grade scale, from 6 = insufficient to 1 = very good). The closed items were repeated in every poll for all the different modules for comparison, while the open-ended questions enabled a topic-based content-specific feedback.

The final survey which will repeat the measurement of the initial survey's constructs and the final interviews have yet to be carried out.

The overall sample consists of 59 distinctive participants of the qualification series (59% female, 39% male, 2% n/a). About 63% among them were involved in teaching, while 25% were in a leadership position. The average work experience was 17.9 years, with a range from 2 to 40 years. Over 60% of the participants held an academic degree, while the others had a background in the (German) VET system.

Over the first five qualification modules, 35 learners took part in the evaluation. Table 3.3 gives an overview on those modules, their contents, and the participants in the evaluation.

In the module polls, the following questions were addressed:

- How do participants perceive the instructional design of the modules?
- How do participants perceive their learning success in the modules?

For the initial survey alone, a research question was:

- What were the motives for taking part in the course series?

Table 3.3 Q-modules in the evaluation

	Type of the Q-module	Goals of the Q-module	n
Q1	Two-day Q-seminar: "Mobile technologies in education"	Getting to know and trying out possible applications of mobile media for educational work; development of implementation ideas for your own practice; confidence in dealing with digital media; and getting to know tools for personal work	5
Q2	Two-day Q-seminar: "Legal foundations"	Gaining confidence in dealing with digital media in an educational context by getting to know and understanding the most important legal principles; confidence in dealing with digital media	9
W1	Advanced webinar: "Open educational resources"	Acquire background and application knowledge for the setting and use of knowledge content on the internet; safety in dealing with digital media and getting to know tools for personal work	6
Q3	One-day Q-seminar: "Presentation tools"	Getting to know alternative digital presentation and documentation tools; security in handling digital media and getting to know tools for personal work; development of application scenarios for your own practice	8
Q4	Two-day Q-seminar: "Using and producing explanatory videos"	Elaboration of criteria for the use of explanatory videos from the internet and for the design of your own learning videos; getting to know and applying technical and film-language basics; elaboration of application scenarios in your own practice; security in dealing with digital media; and getting to know tools for your personal work	7

3.6 Results

For the first four Q-modules evaluated, participants rated the instructional design as follows (Fig. 3.4):

On a generally positive level, Q-module 2 falls behind the other modules in every category. Especially the media usage seemed to leave room for improvements.

Concerning the perceived learning success, results are shown in Fig. 3.5.

Again, Q2 falls behind the other seminars in every category. However, the webinar W2 has notably weaker ratings with regard to learning success. A very similar profile applies to the additional four noncognitive aspects of learning success not depicted here.

Looking at the initial survey and the larger sample of all participants of the qualification series, the motives for taking part become clear (Fig. 3.6):

It becomes clear that learners mainly take part because of job-related motives. In doing so, participants did not intend to put too much effort into the professional development program. Additional results from the entry survey reveal a good internal reliability of the digital self-efficacy scale (M = 3.89; SD = 0.805; Cronbach's alpha = 0.83; eight items), so that the scale can be used for tracing possible competence gains in a pre-post design. However, the mean value of digital self-efficacy is rather low among the sample.

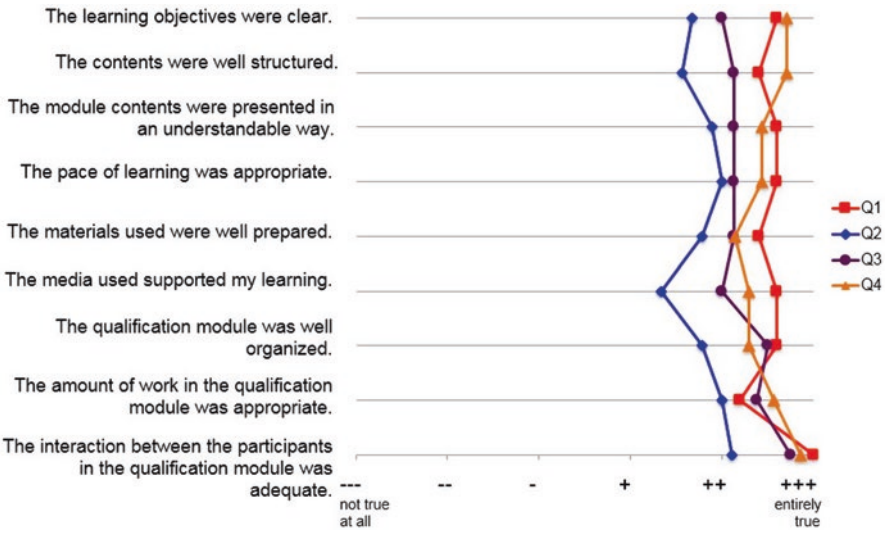

Fig. 3.4 Evaluation of instructional design features

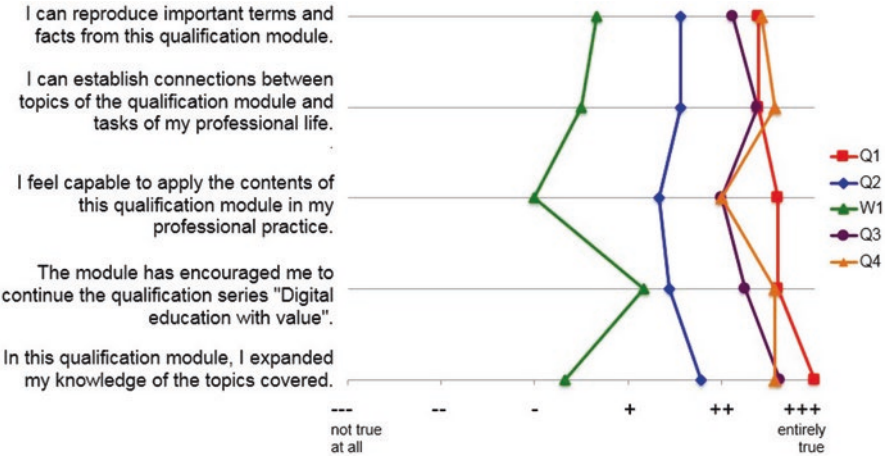

Fig. 3.5 Learning success

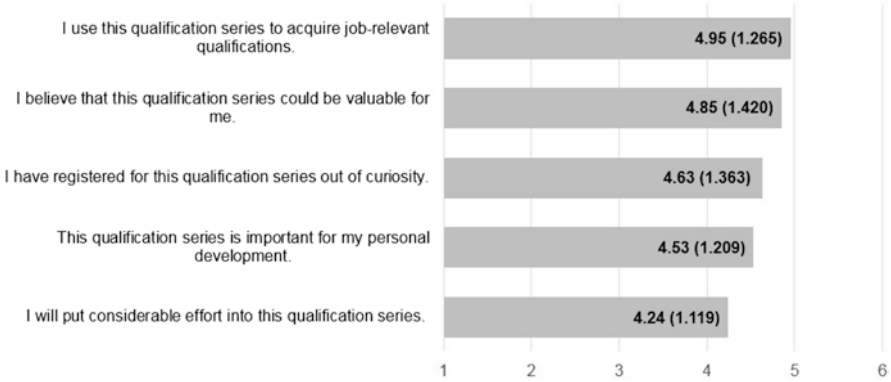

Fig. 3.6 Motivation for participation (M / SD; n = 59)

3.6.1 Discussion

The evaluation concept in #ko.vernetzt is based on three premises: First, openness with respect to access to the qualification series, and openness regarding topics, as the professional development program has been developed in a participatory, demand-oriented way. Second, voluntariness with respect to the participation in the evaluation and the sharing of personal information. Participants can decide whether they can assign a unique identifier to their survey answers, so that the different data can be combined. Third, multi-perspectivity, as the concept aims to address individual and organizational as well as short-term and long-term aspects.

In the first evaluation segment, the quality of the learning offering is analyzed. Results from this segment can provide formative feedback for instructional design and program development. Different topics, trainers, and delivery modes can be compared or benchmarked. The first evaluations show that the webinar, at least back in 2017, was not a feasible option that could replace the face-to-face modules. This, however, might have changed in the meantime, as in 2020 synchronous web-based seminars certainly have become more common.

In the second evaluation segment, individual learning success is the main concept. However, this is only measured via short self-reports, thus in a very subjective manner. Despite all their shortcomings, self-reports are the dominant instruments in educational evaluations in professional learning and development, as other options – let alone objective assessments (Gibson and Ifenthaler 2018; Gibson et al. 2019) –

are mostly infeasible due to business reasons. However, alternative options like peer assessment or 360-degree feedback could be taken into account.

The third evaluation segment tries to address the development of individual competencies. From a purely scientific point of view, this, of course, can only be an approximation. Due to the restrictions in the field, the evaluation concept does not allow for strong research designs. Without a comparison group and a valid competence test, and with little or no control over interventions, causal attributions are hardly possible to be made. However, linking the development of digital self-efficacy to the professional development program on digitalization might still provide valuable insights. Thus, a concluding evaluation should be carried out.

The fourth evaluation segment, finally, addresses the organizational implementation of digital media and IT with a long-term perspective. Here, additional follow-up interviews with disseminators of digitalization or other qualitative data are necessary.

3.7 Conclusion and Outlook

This chapter reported on the quantitatively oriented part of the joint research and development project #ko.vernetzt. The aim of these research efforts was to support and, where necessary and possible, stimulate the process of digital transformation within a networked educational organization. To this end, diagnostic measures and evaluations were implemented, aiming at both the individual (employees) and the organizational (holding, areas, subsidiaries, programs, locations) levels.

In order to carry out an organizational diagnosis on the current state and potential future directions of digital transformation processes within KBW, a maturity model of technology adoption in educational organizations (MMEO) has been developed and operationalized (Ifenthaler and Egloffstein 2020). To assess the effects of the #ko.vernetzt professional development program, a multi-perspective evaluation concept has been implemented. With MMEO and the evaluation concept, we have combined practicability (openness, adaptability) and a scientific approach (accuracy, rigor) in a fruitful way. In the first place, this provided the necessary empirical grounding for qualification measures within KBW. However, the approach can also be transferred to other organizational contexts. For example, selected aspects of the digital transformation survey are taken up in a larger study among various institutions of adult and ongoing education and VET in the state of North Rhine-Westphalia currently.

However, it must be clearly stated that the implementation of a maturity model alone cannot guarantee a successful process of digital transformation. Additionally, a clear digitalization strategy should be formulated and implemented. Such a strategy should not be restricted to the employees and their competencies and the organization and its internal structures and processes. A wider perspective on the market, competitors, and other stakeholders involved is necessary when dealing with the complex phenomenon of digitalization. Moreover, such a strategy involves planning

and targeting. With MMEO, different levels of digital maturity can be defined, but nothing is said about the progression from one level to another. The necessary steps, of course, must be an integral part of a coherent digital strategy.

Finally, this surely is one of the of most basic (and simple) findings of #ko.vernetzt: it is the people who put digitalization into practice. Without committed trailblazers, no real progress can be made. Disseminators need to be true change agents (Vey et al. 2017), and they need to have room for initiative, adequate resources and management support. In such a prolific setting, the digital transformation can be supported and actively managed. On the other hand, organizations that fail to provide such an environment run the risk of falling behind.

Acknowledgments This research was funded by the German Federal Ministry of Education and Research from 2017 until 2020 (funding reference number 01PZ16002A-D).

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Part II
International Perspectives on Digital Transformation of Learning Organizations

Chapter 4
Organizational Learning and Digital Transformation: A Theoretical Framework

Olaf Dörner and Stefan Rundel

4.1 Introduction

There is a widespread agreement that the new information and communication technologies decisively shape and influence the process of modernization during digital transformation (Beck 1996; Castells 2001). These technologies not only influence our daily lives, but they also influence organizations and their actors. To offer an example, the electronic filing out of the tax return forms directly affects the processes of the preparation of these forms. But this above all affects the internal financial management. Another example would be contactless payment with smartphones which has an impact on payment practices but also on retailers and cashiers. Therefore, digital transformation also affects organizations. "The social and economic changes – e.g., globalization, computerization, and economization – have forced more and more companies and institutions in recent years to restructure their organization and adapt them to the new circumstances"[1] (Stang 2003, p. 79). This affects all kinds of businesses. For companies, digital transformation leads to transformation in their internal work organization. For the members of organizations, new media are increasingly finding their way into every day's work. Especially for educational organizations, there are two kinds of impact: Their internal work organization is affected, and the digital transformation is forcing them to introduce media literacy teaching.

While there is a certain discussion on "virtual companies" and the spatiotemporal delimitation of the work in the economic sector (Albach et al. 2000; Rohde et al. 2001), a much broader discourse of digital media within educational science exists

[1] All quotations that are originally in German are translated into English by the authors.

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_4

since the 1990s. It discusses the handling of the new media on the level of the organizations and the level of transformation and reception of knowledge (learning and teaching). This applies not only to the standard schools but also to higher education, adult education, as well as early childhood education. Interestingly, the influence of the digital transformation on the organization takes up little or no space (an exception is a study by Richard Stang 2003 on adult education centers). This becomes even more astonishing when one takes situations such as the current corona crisis in the count. This crisis showed us to what extent the digital transformation affects the level of all the organization: processes are digitized, video conferencing from exception becomes normality, and telecommuting becomes a standard way of working. While work from home was unusual in some areas and had to be fought for, it was now implemented within a few days (Mergener 2020).

In summary, digital transformation affects educational organizations as well as other types of organizations. In cases of business organizations, the possibility of working from anywhere and at any time becomes an important factor in attracting skilled workers. The politics compare educational systems concerning their level of digitization and force changes in the educational systems through appropriate programs. The impact of the new media on learning and teaching in educational organizations is widely discussed. Also in their cases, the digital transformation affects the organization itself. While there are extensive studies on the influence of new media on teachers and those that receive the knowledge, especially at the level of educational organizations, the relationship between the organization, actor, and digital transformation has so far been little examined.

The discipline "Organizational pedagogy of educational science" deals with organizational development and/or organizational learning. It considers not only educational organizations but also organizations in general, and the goal of her research is learning in, from, and between organizations (Göhlich et al. 2016). Our chapter examines from a theoretical perspective the relationship between the organization, actor, and digital transformation. We will conceive digital transformation as irritation or crisis that has to be processed by the organization. If the action routines end, as we are currently observing in the corona crisis, the organization is forced to handle it. Organizational learning is then just as possible as protectionist action. The first part of the chapter will deal with the current debate on digitization. In the second part, we will look deeper into the basic theoretical understanding of this process. This primarily involves determining the relationship between organization and actor. Since the digital transformation is conceived as a crisis, in the third part, we will try to associate this with the concept of transformative education. The irritation or crisis through digital transformation can have different outcomes including refusal, passive appropriation, or a change of the organization. This change will be differentiated into a learning or an educational process. These theoretically conceived types of organizational handling of the digital transformation are discussed at the end. The chapter aims to create a theoretical framework for the relationship between the organization, actor, and digital transformation, which can serve as the basis for empirical work.

4.2 Digital Transformation: An Inventory

If we focus on the term digital transformation, we can mention that it is out of focus. Firstly, transformation denotes fundamentally a transition from a previous to a new state. Secondly, it remains unclear what digital means. Does it refer to the big data (Buschauer and Wadepuhl 2020); to the introduction of digital media, for example, when counting steps (Krämer et al. 2020); or to the new social forms through algorithmization and artificial intelligence? This debate cannot and should not be opened here. For our context, it is sufficient to consider the transition from the analog (paper, files) to the digital (networks, new media, cloud) as well as the associated changes in practice. In the first step, the different types of organizations that are affected by the digital transformation will be illustrated. In a second step, the organizational handling of the digital transformation will be discussed. The chapter focuses on the level of the organization and for educational organizations the level of teaching and learning. Finally, the article presents the opportunities and challenges of digital transformation.

4.2.1 Organizations and Digital Transformation

Different types of organizations appear in the debate about digital transformation. In the educational science debate, organizations such as schools (Lund 2018), universities (e.g., Robra-Bissantz et al. 2019, topic part of the journal for pedagogy 2011), adult education (Aschemann 2017), libraries (Stummeyer 2019), or the research institutions (Stimm 2017) are addressed. Business organizations are also key players in the digital transformation of the educational sector. For example, the online platform YouTube is described by Birgit Aschemann as an education provider (Aschemann 2017, p. 4), and companies such as Mentimeter or Zoom provide required online tools for educational processes. Business organizations themselves are usually addressed with the catchphrase "virtual company" (Albach et al. 2000; Rohde et al. 2001). Also, the cultural sector, especially in times of the corona crisis, is being affected by the digital transformation: Museums offer virtual museum tours, or clubs transfer the music of DJs to the living rooms at the weekend.

Consequently, these organizations have to deal with different types of requirements. Christian Swertz (2017), for example, stresses the need for digital media literacy. In times, where public discourses are increasingly taking place in the digital space, a digitally sovereign and responsible citizen is necessary for the proper functioning of democracy. These digital spaces enable new forms of participation. Educational organizations are increasingly asked to encourage people to take part in these forms. Schools or extra-curricular educational work can and should enable people to participate and to open up new "opportunities" (Swertz 2017, p. 4). Also, educational organizations, such as universities or further education institutions, need to distinguish themselves in a further education market with innovative teach-

ing and learning concepts (Röwert 2019, p. 43). Universities, for example, are increasingly being asked to offer online courses (Pensel and Hofhues 2017), and the increase in the number of students makes new teaching concepts necessary (Nolte and Morisse 2019, p 105). Business demands are also formulated for educational organizations. Interdisciplinary and global teams increasingly require time- and location-independent work and with them new skills (Zickwolf and Neu 2019, p. 51). These digital skills are now labeled as "desirable skills" (Aschemann 2017, p. 2), and there is a need for constant training. This affects not only the organization itself but also the teaching staff (Aschemann 2017, p. 2). Digital media becomes for them important "to promote learning" (Kollar and Fischer 2018, p. 1553).

Politics try to enable educational opportunities for everyone through digital technologies. The "Education offensive for the digital knowledge society" of the German Federal Ministry of Education and Research (BMBF) is worth mentioning. The importance of digital transformation is also framed on a European level. "The European Commission sets this focus in recognition of the ever-increasing professional and private importance of digital technologies in an increasingly digitized environment" (Aschemann 2017, p. 2f). Therefore, the relationship between the economy, the labor market, and education is addressed. Aschemann notes that there is no lack of target definitions in politics, rather adult education institutions are not prepared for it (Aschemann 2017, p. 4). For Rohs et al., the "central development task of adult education is to use more digital media" (Rohs et al. 2017, p. 2). Digital media enable participation in society and the labor market and contribute to quality development in adult education.

4.2.2 Coping with Digital Transformation

The question that arises is how the organizations deal with the requirements of the digital transformation? How can we spell out the organizational practice regarding digital transformation? Therefore, we differentiate between the organization and its actors. On the first level, the organization of the work and the planning of offers are affected. On the second level for educational organizations, we can differentiate between the impact on teaching and learning (von Hippel and Freide 2018, p. 974 for this differentiation).

There are diverse practical examples and evaluation results for the implementation of digital structures within organizations. The miscellany of Robra-Bissantz et al. (2019), for example, evaluates the implementation of explanatory videos, serious games, hack days, augmented and virtual reality, or inverted classrooms for the higher education sector. Maria Stimm (2017) analyzed new digital forms of program announcements for the adult education sector, for example, on the websites of the institutions. These studies primarily focus on the supply and demand aspects. There is a "consistent focus on the technical handling of media" (von Hippel and Freide 2018, p. 995). However, the effects on the organization are only marginally discussed. "The question of what effects the new media have on the organizational

structure of traditional educational institutions has so far not been considered by adult education research and organizational research" (Stang 2003, p. 79). Stang states in his study on adult education centers that new media primarily have an impact on the organization of the administrative work. In the future, however, the influence on the development of offers will be anticipated. The function of the new media is to improve external relations, such as increasing the image or reaching new target groups (Stang 2003, p. 92f). Aiga von Hippel and Stephanie Freide also refer to the effectiveness of change through new media in administration, offer-planning, and marketing (von Hippel and Freide, p. 974). Regarding the level of the organization, Stang states that there is overall a good technical infrastructure. Even if this shows a willingness to change, it still adheres to traditional forms of offer and internal organizational structures (Stang 2003, p. 94). Rohs et al. aptly state that the digital transformation does not only affect the supply and demand side: "The introduction of digital media has an impact on all areas of activity in adult education and also leads to the development of new fields of work" (Rohs et al. 2017, p. 3).

Furthermore, teachers and learners as actors of the organizations are also affected. "On the teaching/learning level, new media changes teaching and learning as well as the role of teachers and learners" (von Hippel and Freide, p. 975). Aschemann (2017) refers to an "EBmooc" which was developed from the association CONEDU with the TU Graz and with geht.digital.at. It addresses adult educators outside of the organizational context. The starting point was the question of "a specific further training offer on job-related digital competence for adult educators" (Aschemann 2017, p. 5). Rohs et al. identify the media literacy of teachers as a central field of action. "Against this background, it seems necessary to take a closer look at the requirements in dealing with digital media in the core of adult education, the work of the teachers" (Rohs et al. 2017, p. 3). Birkenrahe et al. differentiate teachers regarding digital transformation into the motivated, the undecided, and those who refuse (Birkenrahe et al. 2019 p. 31). The development of teachers' skills is the key factor for the proper use of the new media. "The use of digital media has shown changed and new skills requirements in all areas (Rohs et al. 2017, p. 3). This development of media competence is also the central goal for von Hippel and Freide (2018). According to them, new media are "didactic tools" (von Hippel and Freide 2018, p. 974) that can be used for teaching. Against this, the achievement of better learning outcomes through digital media is discussed (Kollar and Fischer 2018; Eckardt and Robra-Bissantz 2019; Huttner et al. 2019). Friedrich W. Hesse and Jens Jirschitzka use the "Activity-Centered Analysis and Design Framework" by Goodyear and Carvalho (Hesse and Jirschitzka 2019, p. 13). It focuses on the spatial-technological structure, the task structure, and the social structure of new media about learning. The use of digital technologies for the learner is for "micro didactic purposes" (Stimm 2017, p. 2).

It is striking that both the teachers and the learners are often discussed without a reference to the organization. Concerning the teachers, the development of competencies is addressed in the media education discourse. Concerning the learners, the question of learning psychological models that go hand in hand with the new media is discussed. Contrary to this, the perspective of organizational peda-

gogy focuses on the relationship between organization and actors to organizational learning in, from, and between organizations. This perspective helps us to understand the coaction between actors and organizations. Especially educational organizations have the peculiarity that learning is organized in them and that they can be viewed as learning organizations themselves. Learning is therefore united in two ways (Feld and Seitter 2018, p. 84). But before going into this, the following chapter briefly discusses the opportunities and challenges of digital transformation.

4.2.3 Opportunities and Challenges of Digital Transformation

Both opportunities and challenges are discussed as a part of the debate on digital transformation. The development of digital identities in "digital thinking rooms" (Hesse and Jirschitzka 2019, p. 14) is seen as an opportunity as well as the possibility of new forms of teaching. Thanks to this, e.g., learning can be organized more flexibly regardless of strains of time and location. Digital transformation combined with digital media literacy, as discussed by Swertz (2017), enables new forms of participation in the democratic processes for the citizens. So-called MOOCs, lectures by qualified professors, can be accessed worldwide without being held back by tuition fees. Platforms, such as YouTube, provide equal access to knowledge for everyone. Digital media thus enables a self-directed form of knowledge acquisition (Kollar and Fischer 2018, p. 1553). But, digital transformation also brings challenges with itself. Problems with data protection (Ezat et al. 2019, p. 182), job losses due to automation (Aschemann 2017, p. 3), or the question, whether e-learning offers an increase in efficiency (Aschemann 2017, p. 5), are just some that are frequently discussed. The question of relationship in learning processes is also occasionally analyzed, as well as the loss of importance from teachers through digital reproduction/open educational resources (Aschemann 2017, p. 5). Stang also states the anticipated concerns of staff in adult education centers, e.g., increasing workload or missing training (Stang 2003, p. 90f).

Digital transformation enables the reduction of barriers between persons and institutions through broad accessibility. But there are also challenges related to pedagogical and technical questions. The German primary school association made a critical statement regarding digital media in primary schools (Hecker 2019). The age of primary school children and the unforeseeable consequences of digitization to environmental pollution (Welzer 2016) are often used as arguments against the introduction of digital media in primary schools. We will leave those at side though because the goal of our chapter is not to evaluate the advantages and disadvantages of digital transformation. The question that needs to be asked here is rather to what extent the practice in organizations changes due to this "media hype" (Hecker 2019, p. 39)? To what extent can organizational practice be determined between actors, organizations, and digital transformation? Particular in educational organizations, there is the aspect of education and pedagogy, i.e., the extent to which learning in organizations is also influenced by the digital transformation.

4.3 Organizational-Theoretical Considerations: The Relationship Between Actor and Organization

For an understanding of digital transformation in organizations, it is important to clarify the relationship between the actor and the organization. Does organizational learning mean the learning of actors in organizations? Or does organizational learning take place independently from the actors? A central article within this debate was written by the sociologists Chris Argyris and Donald Schön in 1978 (Pätzold 2017; Göhlich 2018). For these authors, the paradox of organizations is that they cannot be understood only as a collection of individuals nor that there are organizations without them. It can be deduced from this that individual and organizational learning are interdependent, but cannot be the same. "Further, it is clear that organizational learning is not the same thing as individual learning, even when the individuals who learn are members of the organization. There are too many cases in which organizations know less than their members" (Argyris and Schön, p. 9).

For Argyris and Schön, knowledge structures involve acting and learning. Without making an explicit reference to Karl Mannheim's sociology of knowledge, they also differentiate between explicit-theoretical and implicit-atheoretical knowledge (Dörner 2011; Bohnsack 2014). Explicit knowledge is a communicative and generalized knowledge and serves to interpret actions (Dörner 2011, p. 167f). Every reflected action has a cognitive basis that reflects norms, assumptions, or models that we consider credible (Argyris and Schön 1978, p. 10). Learning is then not a reinforcement of habits, but a testing and restructuring of a certain type of knowledge (Argyris and Schön 1978, p. 10). Argyris and Schön call this the "theory of action." The emergence of rules applies to the collective and forms an organizational "we" (Argyris and Schön 1978, p. 10). The "theory in use" can now be distinguished from the "theory of action" (Argyris and Schön 1978, p. 11). Mannheim speaks from implicit-atheoretical knowledge (Dörner 2011, Bohnsack 2014). It is the pre-reflexive knowledge that guides our actions, and that is difficult to access reflexively. While the "theory of action" is reflected in organizational charts, for example, the "theory in use" can be observed in practice (as incorporated knowledge) or reconstructed through the implicit knowledge base of the organization members (Bohnsack 2014). We all know this from organizations: what is expressed in mission statements does not by far structure the practices in organizations. One could imagine that the compatibility of work and family is anchored in the mission statement, but the temporary contract of a pregnant woman is not extended.

Argyris and Schön determine the relationship between actor and organization in a way that the actors act on behalf of the organization. They understand the organization as a complex organism in which each actor has a self-image that he compares with the overall picture of the entire organism. "Each member of the organization constructs his or her own representation or image, of the theory-in-use of the whole. That picture is always incomplete" (Argyris and Schön, p. 16). The self-image is incomplete, and public pictures, so-called public maps, are necessary to complete it. "Organizational theory-in-use, continually constructed through indi-

vidual inquiry, is encoded in private images and in public maps. These are the media of organizational learning" (Argyris and Schön, p. 17). Organizational learning is then the reconciliation of "private images" and "public maps." Concerning organizational learning, Argyris and Schön differentiate between single-loop, double-loop, and deutero-learning. In single-loop learning processes, the actor's theory of action changes, but no organizational learning takes place. In double-loop learning processes, external requirements set new priorities within the company. "We will give the name 'double-loop learning' to those sorts of organizational inquiry which resolve incompatible organizational norms by setting new priorities and weightings of norms, or by restructuring the norms themselves together with associated strategies and assumptions" (Argyris and Schön, p. 24). If the organization finds forms for the organization of double-loop learning, Argyris and Schön speak of deutero-learning.

Organizational learning from this perspective is linked to the practice of the organizational members. Claudia Fahrenwald writes: "Organizational learning in the context of practice is understood as a permanent process of (re) ordering and giving meaning" (Fahrenwald 2016, p. 103). The basic assumption of this practice-theoretical perspective is that the knowledge structures action and the practice of the organization members (Dörner 2011). In this context, learning is much more an "interactive, social process that is in principle open to results" (Fahrenwald 2016, p. 102) and less a cognitive achievement. Michael Göhlich expresses a weakness of the Argyris and Schön model. He criticizes the neglect of "incorporated practice patterns" (Göhlich 2018, p. 371). Nevertheless, this basic theoretical perspective opens up the possibility of understanding the digital transformation as a "public map" that leads to confusion in the "private images" of the organization members. This must be reconciled in the organizations at the level of the "theory of action" as well as at the level of the "theory in use."

According to Göhlich, organizational learning can be divided into three different categories: individual learning of the organization members, learning by participating in communities of the organization, and finally learning of the organization (Göhlich 2018, p. 374). In this way, learning does not remain at the individual level, but it is incorporated into the practical community of the organization and the structure of the organization. With his theory of organizational learning, Göhlich focuses on the mimetic processes. "It should be noted that organizational learning should not only be understood as a reflection and change in mental models, but also as mimetic and possibly reflective processing of organization-specific practical patterns" (Göhlich 2018, p. 375). Against this background, he problematizes the lack of views to the learning content and distinguishes four dimensions of learning (Göhlich 2018, p. 375f): learning a knowledge, learning a skill, learning life, and learning to learn. While the first relates to (specialist) knowledge that also exists independently of the body, the second relates to knowledge that is tied to the person. The third relates to knowledge that becomes necessary in transitions and, above all, uncertain times of (post) modernity. The fourth dimension of learning relates to all learning objects.

These four dimensions will be elaborated in the following concerning the digital transformation. The digital transformation doesn't affect only one dimension; the organization has to cope on different levels with the digital transformation. The organization must provide knowledge that is independent of the actor, for example, for digital forms of networking (knowledge-learning). The actors must also have the opportunity to master these digital media, for example, digital networking tools. The function of the educational organizations, which was worked out in the first part of this chapter, should be pointed out here: they have to impart media competence at various levels (skill-learning). At the level of life-learning (third dimension of Göhlich), there is another aspect of digital transformation: it is dealing with the uncertainty that goes with it. Hannah Arendt already emphasized in her famous quote the job loss anticipated by automation. "What lies ahead is the prospect of a working society that has run out of work, the only job that it still understands" (Arendt 2014, p. 13). Not only the organization is affected by the digital transformation but also the individual actor and society. After all, the entire idea comes down to the institutionalization of this learning. The digital transformation requires, in the sense of deutero-learning, to counter the rapid change through forms of reflexivity (Beck 1996). The digital transformation not only challenges the organization but also the actor and the relationship between the actor and the organization. Digital transformation understood as irritation must be worked on by organizations and actors.

We believe that actors and organizations are in a reciprocal relationship. In our understanding, organizational learning is neither exclusively individually nor structurally. It takes place in the medium of the "theory of action" and the "theory in use." The digital transformation addresses all four dimensions of learning described by Göhlich. Surprisingly, the central distinction between learning and educational processes is hardly made in the debate on educational science. This can be taken up with a transformative concept of education. It enables a differentiated view on the influence of digital transformation on organizations and their changes.

4.4 The Crisis: An Occasion for Learning and Educational Processes

This part explores the idea that there is a difference between learning and educational processes. There is hardly a distinction on this idea within the debate of organizational learning. As opposed to this, there is a wide debate on this topic within the German educational science discourse. We can differentiate educational and learning processes along with the level of transformation that happens through an object. Since organization in general consists out of individuals and at the same time is more than just the aggregation of the individuals, it also makes sense for organizations to differentiate between education and learning processes. We can understand learning as a solution to single problems, while educational processes change the

organization as a whole. Argyris and Schön distinguish this between single-loop and double-loop or deutero-learning. This will cope with the terms of learning and educational processes.

The German debate on "transformative education" assumes educational processes as a change in the "world-self relationship" (Marotzki 1990). They represent a habitual transformation and a fundamentally changed worldview, while learning is conceived as the incorporation of knowledge into existing frameworks. Following Winfried Marotzki, Nohl et al. (2015) differentiate between "frame-inherent" and "frame-transforming" changes in their empirical reconstruction of learning and education. A fundamental factor in an educational process is a crisis that stops previous routines and allows room for shifts in relevance (Nohl et al. 2015). In this context, Käte Meyer-Drawe (2012) speaks of an "occurrence." The focus is not so much on the educational theory debate on transformative education (see for this: Nohl et al. 2015, p. 222ff), but rather on differentiating learning and educational processes from the moment of the crisis. "In this sense, crises are constitutive for the educational process in all cases, insofar as they create the necessary opportunities for new things, enable a shift in relevance and thus help new orientations to breakthrough" (Nohl et al., p. 68).

Now we can transfer this model to the organizations, which we above all understand as human social structures. "Organizational learning occurs when members of the organization act as learning agents for the organization, responding to changes in the internal and external environments of the organization by detecting and correcting errors in organizational theory-in-use, and embedding the results of their inquiry in private images and shared maps of organization" (Argyris and Schön 1978, p. 29). According to Argyris and Schön, organization members act on behalf of the organization and determine the relationship between the individual and the organization. If some irritation arises, as Nohl et al. (2015) have worked out, it influences the "theory in use" within the organization. The digital transformation as a central theme of (post-) modernity functions as irritation or, in its broad context, as a crisis that can be seen as a learning and/or educational occasion. If singular learning takes place in the sense of single-loop learning, we speak about organizational learning. Digital infrastructure is implemented: the "private images" and "public maps" are compared. There is a learning of knowledge and learning of skills within the organization. If there is, on the other hand, a fundamental change in the organization, a double-loop or deutero-learning, then we can speak about an educational process, which is a changed world-self-relationship of the organization and its members. This goes hand in hand not only with new production lines but also with a shift in the understanding of the organization. This includes, for example, the changed life situation of its members through the digital transformation. Life-learning is taken into account by, for example, incorporating changes in everyday rhythm through telecommuting or issues such as job loss through automation. Learning-learning, as mentioned by Göhlich, also gains new meaning through automation. Simple processes are carried out by the machines, which fundamentally change job descriptions.

From this perspective, the digital transformation appears as a crisis and shakes established routines. It influences through its comprehensive social significance the "private images" and "public maps." Organizations must now deal with this discrepancy. This happens either because of the influence of "public images" through politics or society or because of the "private images" of the organization members, when they demand, for example, work regardless of time and location. The crisis can lead to collective educational processes within the organization, which in the sense of a double-loop or deutero-learning also have an enormous impact on the organization. However, if only individual aspects change, then organizational learning takes place, but the DNA of the organization remains unchanged. Finally, empirical questions remain to what extent digitization processes initiate collective educational processes within an organization and what effects they have on the organization? What are the conditions, to implement educational processes (in the way of double-loop or deutero-learning)? What is the role of the management and what happens if they fundamentally change their actions? In which way does the management organize processes of organizational learning?

4.5 Conclusion

Our considerations have hopefully made it clear that digital transformation in (post-) modern societies is a profound and complex process. This affects not only business organizations but also educational organizations, administrations, and politics. It is necessary to determine the understanding of organizational learning and the relationship between actor and organization to consider the digital transformation with organizational learning. Following Argyris and Schön (1978), the chapter pursues an argument in which actors act on behalf of the organization and constantly compare their "private images" with the "public maps." If there are differences, the result of these differences are single-loop, double-loop, or deutero-learning processes. The educational-theoretical discourse on transformative education offers two central insights: The digital transformation understood as a crisis has an impact on organizations and their members. And there is a difference between learning and educational processes. With these two insights, it is possible to create four theoretical types of dealing with digital transformation within organizations. First, the digital transformation understood as a crisis has the potential to stop existing routines. This contributes to a change in the understanding of the organization. Previous action routines dissolve through collective educational processes and, in the sense of double-loop or deutero-learning, also exert an influence on the framework-change within the organization. Both the "theory in use" and the "private images" as well as "public maps" are in the process of constant shifting. Second, digital transformation doesn't lead to the dissolution of action routines, but rather to the establishment of new processes. It is then a matter of learning knowledge or learning a skill (Göhlich 2018, p. 375), while the understanding of the organization does not change. Only individual aspects change in single-loop learning mode, within the scope of

action of the organization. In addition to these two theoretically conceived types, two further types are conceivable. There is, thirdly, a type that implements digital artifacts that are not used. We can conceive organizations that introduce a "wiki", a digital platform for knowledge, that is not used by any organization member. Fourthly, a type is finally conceivable that actively refuses digital transformation. The organization adopts an attitude that not only passively refuses, like type three, but also actively protects one's action routine from digital influence. It uses arguments such as data protection or globalization.

In his studies, Arnd-Michael Nohl empirically analyzed milieu-specific factors for dealing with the rules of the organization (Nohl 2006, p. 189). If we take these milieu-specific factors into account, there are further interesting differentiations on how actors in organizations deal with digitization: Firstly, the actors can undermine the introduced digitization measures along with the habitual practices of their milieus. Secondly, the actors can understand and follow the digitization measures in a milieu-specific manner. Thirdly, they are fleshed out through informal handling. This results from the use of digital media and has proven itself widely.

Empirical work can now build on this theoretical ideal-type formation in Max Weber's sense (Weber 1922). In times of the corona crisis, the digital transformation could be conceived as the end of previous action routines, which leads to a new negotiation of "private images" and "public maps." It would be interesting to reconstruct this process from the practice. Then questions arise either it leads to a fundamentally new understanding of organization concerning digital transformation or it continues to adhere to previous action routines, and, for example, video conferences are only in the sense of single-loop learning used.

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Chapter 5
Learning Organizations in the Age of Smart Machines

Fusion Skills, Augmentation Strategies, and the Role of HRD Professionals

Christoph Meier, Sabine Seufert, Josef Guggemos, and Judith Spirgi

5.1 Resurgence of the "Learning Organization"

We experience the far-reaching changes that are referred to as "digital transformation" on a daily basis: when placing an order via an online store with our tablet; when asking a smart speaker for the weather forecast for the afternoon; when streaming our favorite music from our personal playlist via our smartphone; or when pulling up the latest tools for collaborative work on our computer desktops in our office. This digital transformation is based on the use of advanced technologies (e.g., cloud services, mobile computing, sensors, and artificial intelligence). It is reflected in the way internal business processes, customer journeys as well as customer touchpoints, and business models are redesigned (Solis 2014; Krcmar 2015; Schuchmann and Seufert 2015; Meier et al. 2018).

In the course of this transformation, there has been much debate about the need for businesses and organizations to become more flexible, to become more innovative, and to become better at learning in order to deal with rapidly changing contextual conditions. These discussions involve professionals in the area of human resource development (HRD) and organization development (OD) who invoke concepts that were en vogue already some 30 years ago: "learning organization" and "culture of learning." Both concepts are relevant for HRD professionals designing and managing learning and development processes in organizations (Seufert 2013, 57–61 and 158–160), and discussions on the need for organizational learning and requisite cultures of learning take place during practitioner conferences (e.g.,

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_5

Corporate Learning Conference, Munich[1]), in books published by reflective practitioners (e.g., Paine 2019) and in research in the area of organization development and learning organization (see Örtenblad (2019) and specifically Hoe (2019)).

In this chapter, we argue that research on the concept of the "learning organization" has, so far, failed to appreciate the relevance of two intertwined loci of learning in organizations and drivers for organizational performance: (1) advanced digital systems ("smart machines") and their ever-growing capacity for carrying out tasks and (2) collaboration of employees with smart machines and the specific skills and development strategies this requires. These two loci come together in hybrid activities that are performed collaboratively by humans and machines and that enable higher levels of performance and productivity (Fig. 5.1).

Fusion skills are skills required to achieve the full productive potential of collaboration between humans and smart machines. Examples are training smart machines for performance and acceptance; algorithmic testing, editing, and output interpretation; and managing the operations and performance of smart machines. Augmentation strategies are development strategies for humans to remain employable in the face of increasing numbers of smart machines in the workplace. The key strategies are step in, step up, step aside, step forward, and step narrow. We explain these strategies, and we provide results from empirical research among HRD professionals in German-speaking countries on their stance toward augmentation strategies. We conclude this chapter by stressing that HRD professionals (1) need to understand smart machines, fusion skills, and augmentation strategies as well as their implications at a personal level, (2) need to establish effective practices that are oriented to fusion skills and augmentation strategies, and in this way (3) need to contribute to the move toward a learning organization.

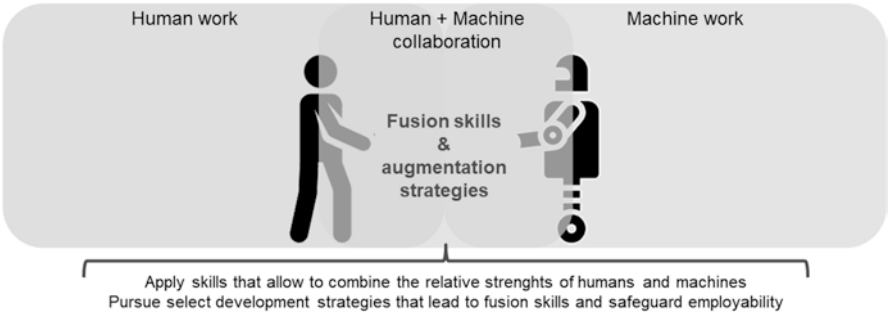

Fig. 5.1 Human + machine collaboration, fusion skills and augmentation strategies; icons by Flaticon

[1] See the list of contributions for the 2019 and 2020 editions of the conference at https://corporate-learning-konferenz.de/

5.2 Smart Machines and the Locus of Learning

A specific quality of the digital transformation that we currently experience – what Wahlster (2017) refers to as the second wave of digitalization – is the involvement of artificial intelligence (AI) and AI-enabled smart machines. Increasingly, smart machines find their way into our homes (intelligent digital assistants like Alexa, Cortana, or Siri), into our cars (autonomous driving mode), and into our workplaces (collaborative robots, chatbots, AI-based apps and Web services, etc.). With these developments there is the question of how this affects learning in organizations and especially learning organizations.

There is quite a debate about how a "learning organization" can and should be conceptualized and where the learning actually takes place (Bui 2019). A definition we find useful and take as a starting point for this chapter is one that has been provided by Watkins and Marsick, originally in 1993:

"The learning organization is one that learns continuously and transforms itself. Learning takes place in individuals, teams, the organization and even the communities with which the organization interacts. Learning is a continuous, strategically used process - integrated with, and running parallel to, work. Learning results in changes in knowledge, beliefs and behaviors. Learning also enhances organizational capacity and growth." (Watkins and Marsick 2019, p. 53).

5.2.1 The Role of Technology

When reviewing research on the "learning organization" as it is represented in the comprehensive and current *The Oxford Handbook of The Learning Organization* (Örtenblad 2019), we notice that technology is almost completely absent. Out of the 30+ contributions to this volume, only 2 mention technology as relevant to the learning organization. For Watkins and Marsick (2019, p. 55), technology is relevant to the learning organization in that organizations require systems to capture and share learning – for example, platforms for knowledge management or learning management. In the chapter contributed by Marquardt, technology figures more prominently as one of several subsystems of a learning organization: "The technology subsystem is composed of supporting, integrated technological networks and information tools that allow access to and exchange of information and learning. It includes technical processes, systems, and structures for collaborating, coaching, coordination, and other knowledge skills. (…) The two major components of the technology subsystem apply to managing knowledge and enhancing learning" (Marquardt 2019, p. 108).

Technology, as it emerges from these contributions, is relevant to the learning organization insofar as it provides "knowledge freeways" (Marquardt) and infrastructures to support exchange of information, collaboration, and access to learning resources. We disagree with this view as it misses two in our opinion key aspects: 1)

artificial intelligence (AI) along with the availability of cheap processing power and huge data sets enables smart machines that can become continually more powerful – even without human intervention[2] – and 2) the collaboration of humans and smart machines and the learning it takes to fully exploit the potential for performance and productivity gains of this collaboration.

5.2.2 *Learning at the Intersection of Smart Machines and Humans*

Recent development in the field of AI and particularly with regard to machine learning has resulted in "smart machines" that can perform activities that were previously unthought of. Smart machines have become extremely good not only at rule-based games such as chess, go, and poker or even formal debating. They are also employed in medical diagnosis, surveillance, engineering, journalism, precision farming, and many other areas. And, what is more, these smart machines can increasingly learn autonomously on the basis of mechanisms such as unsupervised learning or feedback learning (Jones 2017). This has led to an extensive debate about the future of work and employment, prominently starting with the so-called Oxford study (Frey and Osborne 2013).

What is missing in the research on the learning organization, from our point of view, is an appreciation of the relevance of (1) advanced digital systems ("smart machines") and (2) the interaction of employees with these smart machines (augmentation) as relevant loci of organizational learning.

Figure 5.2 illustrates the loci of organizational learning as proposed by Watkins and Marsick (2019) and their intersections. In particular, it highlights that (1) smart machines are an element of technology; that (2) the fusion skills required to fully capture their potential intersect with people (employees); and that (3) the augmentation strategies required to develop fusion skills intersect both with people and technologies.

As smart machines are increasingly becoming part and parcel of a wide range of work contexts (Brynjolfsson and McAfee 2014; Brynjolfson and McAfee 2017), the ability to productively employ such machines and to collaborate with them becomes an important aspect of organizational learning: learning that takes place at an individual level ("fusion skills"), at the level of technology (various forms of machine learning to improve on algorithms), and also at the level of the organization (e.g., establishing a culture of rigorous rethinking of business processes in order to capitalize on the potential of smart machines).

The focus in this chapter will be on the interaction of employees with smart machines as a locus of organizational learning. A source of inspiration for our thinking has been Kasparov's experience with chess computers. In his book *Deep think-*

[2] A striking example is this video (https://youtu.be/kopoLzvh5jY) provided by the company OpenAI that shows how software agents solve problems when playing hide and seek and how these agents become more powerful the longer they play against each other.

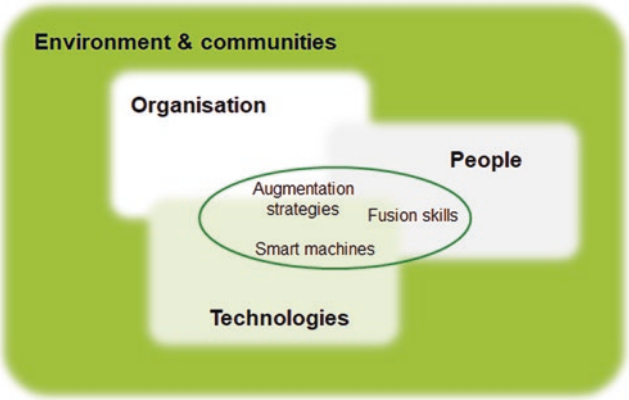

Fig. 5.2 Loci of learning and the focus of this chapter: smart machines at the intersection of organization, people, and technology

ing (Kasparov 2017a), Kasparov reflects on the implications of the powers of smart machines. In particular, he draws inspiration from developments such as freestyle chess, where teams of humans and machines (so-called centaurs) compete against each other. From the surprising finale to a chess tournament, he concludes the following:

"The winner was revealed to be not a Grandmaster with a state-of-the-art PC, but a pair of amateur American players (…) using three computers at the same time. Their skill at manipulating and "coaching" their computers (…) effectively counteracted the superior chess understanding of their Grandmaster opponents and the greater computational power of other participants. It was a triumph of process. (…) I represented my conclusion like this: weak *human + machine + better process* was superior to a strong computer alone and, more remarkably, superior to a *strong human + machine + inferior process*." (Kasparov 2017a, p. 246).

From this Kasparov concludes "Don't fear intelligent machines – work with them" (Kasparov 2017b).

In a similar vein, Brugger and Kimmich (Brugger and Kimmich 2017, p. 34) encourage the exploration of complementary cooperation between humans and smart machines in the industrial sector in order to attain new and previously impossible levels of productivity and value creation.

However, neither Kasparov nor Brugger and Kimmich explore in any detail just what is required for this complementary collaboration or what competences and strategies are required on the part of employees to make this happen. Two concepts have been proposed that we consider as highly relevant in this regard and which we have explored in our research and development work. One is the concept of "fusion skills" developed by Daugherty and Wilson (2018). The other is the concept of "augmentation strategies" developed by Davenport and Kirby (2016). We will present these concepts in the following sections.

5.3 Humans + Machines

5.3.1 Hybrid Activities

Research and discourse about the impact of smart machines has, to a large extent, focused on the aspect of substitution: what tasks and activities smart machines currently are or soon will be able to perform and what the implications for the labor market are (e.g., Frey and Osborne 2013; Nedelkoska and Quintini 2018). Daugherty and Wilson (2018) argue that with this focus on either tasks performed by humans or alternatively tasks performed by machines, an important range of activities is lost out of sight: hybrid activities where humans and machines closely collaborate – as exemplified in the case of centaurs playing freestyle chess.

Two types of hybrid activities can be distinguished (Daugherty and Wilson 2018): (1) activities where humans complement smart machines and (2) activities where smart machines boost human capabilities. Examples of the first type are, among others, (i) training them for performance and acceptance (discovering, cleaning and tagging data, correcting errors, etc.), (ii) explaining them to various stakeholders and making sense of their output, and (iii) sustaining them by managing operations and performance. Examples of the second type are (iv) amplifying analytical powers by identifying trends in data, (v) enabling voice-powered access to information and services, and (vi) extending capabilities for seeing or hearing (Daugherty and Wilson 2018, pp. 116, 123, 127, 142, 145, 147) (Fig. 5.3).

Daugherty and Wilson (2018) argue that in order to carry out hybrid activities, specific skills on the part of humans are necessary. We will turn to these skills now.

5.3.2 Fusion Skills as Success Factors for Learning and Performance

There are several success factors for hybrid activities and for close collaboration of humans and smart machines that Daugherty and Wilson point out – based on survey research and consulting conducted by Accenture. In addition to mindset (readiness to radically rethink established business processes), openness to experimentation, leadership committed to the responsible use of smart machines and a data supply chain that fuels smart machines (2018, pp. 8; 13–15), they stress the importance of "fusion skills":

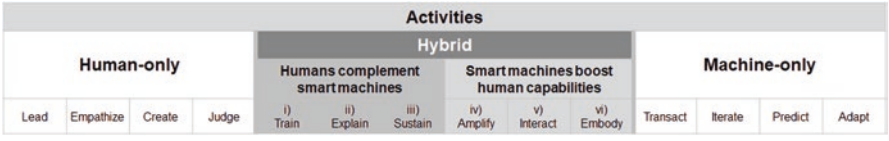

Fig. 5.3 Types of hybrid activities. (Source: Daugherty and Wilson 2018, p. 8 and passim)

"In our work and research, we see evidence of at least eight novel fusion skills (…) that workers will need. Each skill draws on the fusion of human and machine talents within a business process to create better outcomes than working independently." (Daugherty and Wilson 2018, p. 184).

Daugherty and Wilson subsequently mention the following fusion skills (2018, pp. 186–203):

- Shaping the perception of smart machines in a responsible way.
- Passing judgments on the performance of smart machines and taking decisions – for example, with regard to deviations from expected results or limits to the tasks allocated to machines.
- Intelligently interrogating smart machines in order to tease out meaningful analytic results from large data sets.
- Working "hand in hand" with smart machines.
- Reciprocal apprenticing, i.e., on the one hand, performing tasks alongside smart machines so that these can learn new skills (humans acting as role models, e.g., for a chatbot) and on the other hand learning to work well with these machines (e.g., by developing robust mental models of how they operate/perform).

As smart machines are becoming more commonplace in organizations and work environments, so are fusion skills becoming more relevant. Without the command of fusion skills in the workforce, organizations will not be able to fully take advantage of the continually developing potential of AI-based technologies. In consequence, they will miss out on one aspect of being learning organizations.

One area where smart machines and related fusion skills are becoming clearly visible is the area of care. Care robots and companion robots are piloted and deployed both in hospitals and in homes for the elderly (Bendel et al. 2020). This entails a range of new tasks for professional care givers as explained by Bendel et al. (ibid.) – tasks and skills that can be related to fusion skills as discussed above. Examples are the following:

- Introducing care robots to those who receive care and to establish realistic expectations as to what they are able to do and what they cannot (e.g., to what extent the robot is able to provide physical support in getting up or when leaning on it).
- Adjusting physical arrangements around a bed or seating area for convenient access of patients to the care robot and vice versa.
- Placing companion robots in areas where low noise levels allow interactions via natural language processing to run off sufficiently smooth.
- Deciding whether or not individual person recognition is sufficiently robust to allow care robots to carry drinks, meals, or even medicines to designated recipients.
- Ascertaining that defined taboos (e.g., refraining from touching the eyes or the necks of patients) and conventions such as closing doors to private rooms can and are reliably observed by care robots.

So far, we have argued that smart machines, and the fusion skills required to effectively collaborate with them, are important loci of learning in the digital age.

Such fusion skills cannot be presupposed. Rather, they need to be diagnosed and – if lacking – developed. In case these fusion skills need to be developed, it is as yet unclear just how the workforce is to be developed in order to realize the potential that comes with smart machines. This is where the concept of "augmentation strategies" introduced by Davenport and Kirby (2016) becomes relevant.

5.4 Augmentation Strategies

Augmentation denotes – in contrast to substitution – the mutual enhancing and enablement of humans and smart machines, in particular in the context of collaboration of humans and smart machines. Augmentation can be differentiated into three categories (Raisamo et al. 2019, p. 132): augmented sensing (e.g., augmented vision, hearing, or smelling); augmented action (e.g., amplified force, movement, or telepresence); and augmented cognition (e.g., providing stored information during natural interaction). In the context of human resource development, Davenport and Kirby (2016) refer to augmentation strategies as developmental strategies related to smart machines in the workplace. Davenport and Kirby (2016) distinguish five such developmental strategies that are independent of industries and professions:

- Step in: Work with smart machines.
  - Be knowledgeable about specific smart machines (and their limitations).
  - Work productively with specific machines (and perhaps also train algorithms).
  - Provide feedback to developers for further improvement.
- Step up: Evaluate and manage smart machines.
  - Evaluate smart machines and results they achieve.
  - Decide on where to employ which machine in what way (and where not to).
  - Manage business processes involving smart machines.
- Step aside: Apply specific human capabilities (possibly building on the work of smart machines).
  - Focus on tasks that go beyond information processing and that require specific human competences such as demonstrating empathy, motivating, or creative problem-solving.
- Step forward: Develop smart machines.
  - Participate in the development of smart machines and their application to new domains.
- Step narrow: Specialize and evade smart machines.
  - Focus on and specialize in a niche where the use of smart machines is not economical.

Table 5.1 provides examples of these strategies from different industries:

Table 5.1 Augmentation strategies. (Based on Davenport and Kirby 2016)

Strategy	Example legal profession	Example marketing	Example HRD
Step in	Develop deep expertise in automated analysis of contracts (eDiscovery) on the basis of specific software tools	Develop deep expertise in applying and monitoring automated pricing mechanisms	Develop deep expertise in learning analytics and recommendation algorithms for improved recommendation system for digital learning content
Step up	Take decisions on where/how eDiscovery tools will be relied on in contract analysis and trial preparation	Orchestrate the use of digital systems for brand management	Orchestrate decisions on the ethical use of personalized user data in order to improve intelligent learning systems
Step aside	Focus on, e.g., consulting and customer management (while building on results provided by smart machines)	Focus on creative work and customer management (while building on results provided by smart machines)	Provide coaching for workplace learning supported by appropriate digital tools and personalized, intelligent (learning) systems
Step forward	Participate in the (further) development of solutions for eDiscovery	Participate in the (further) development of solutions for optimizing the placement of advertisements	Contribute technical expertise to the development of a new intelligent tools, e.g., chatbots helping to sketch a personal development plan
Step narrow	Focus on legal counseling for underage minors	Focus on marketing activities in public spaces	Facilitate design thinking sessions on solutions for a culture of learning and innovation

Davenport and Kirby focus on highly qualified knowledge workers, for example, in the legal profession, in financial services, or in marketing. In the course of joint development work with HRD professionals from major corporations in the context of our innovation circle on augmentation (Meier 2019), it became apparent that these developmental strategies are also relevant for other sections of the workforce. Examples are skilled workers in manufacturing, in logistics, and in the area of customer services such as work in mail sorting centers or call centers.

There are, however, differences. Davenport and Kirby (2016) imply that augmentation strategies are a matter of individual preference and personal perseverance. This may be the case in the context of small professional service organizations and in the case of highly skilled professionals. In the context of large businesses and corporations, however, augmentation strategies are also a matter of strategic initiatives in the area of workforce management. In these contexts, (line) management often decides on which augmentation strategy is to be pursued by which job family (Meier et al. 2019, p. 830).

The important point for our argument here is that augmentation strategies are relevant to large parts of the workforce and therefore are a relevant concern for HRD professionals. Preparing employees from entire job families for very different

production and service processes, for collaboration with smart machines, and for continually changing competency requirements is a major challenge for any organization and, in particular, for HRD professionals. To face this challenge, HRD professionals need to go beyond the typical activities of needs analysis and competency development. Rather, four interrelated groups of tasks are required (Meier 2019):

- Needs analysis and competency development activities
  When smart machines are introduced to the workplace, work processes are redesigned, and the allocation of tasks and activities between humans and machines changes. For specific job families and jobs, augmentation strategies need to be defined, and, from these, specific development needs can be derived. For example, what skills and competences are required for a "step in" strategy in contrast to a "step aside" or a "step up" strategy?
- Facilitation of change
  As smart machines are becoming more widespread in workplaces, more and more job profiles change. These changes may be more or less extensive and may require significant changes in the way people view their work and profession. Providing coaching and support in this transition process is important.
- Measurements, stage gates, and evaluation
  In supporting competency development and in facilitating change, HRD professionals need to take measures on aspect such as awareness of smart machines and the changes they are about to induce, readiness for change and for the progression to an adjusted task and job profile, status on new skills and competences, and, last but not least, performance in new tasks.
- Tools and work aids
  In the context of the abovementioned innovation circle, specific work aids related to these three groups of tasks have been drafted, tested, and refined. These tools and work aids need to be understood and possibly adapted to specific contextual conditions.

Figure 5.4 illustrates these four intersecting groups of tasks as they were concretized in the course of the innovation circle (Meier 2019).

Developing the workforce in accordance with the requirements of specific augmentation strategies and facilitating the transition to altered task and job profiles are demanding tasks for HRD professionals. We are convinced that the more effective HRD professionals are in implementing these four interrelated work streams, the better their organizations will be able to move forward with smart machines, augmentation, and altered business processes – i.e., the better they are on their way toward being learning organizations in the age of smart machines. For this, it is important that HRD professionals understand the concept of fusion skills and also the different augmentation strategies as well as their implications. We will elaborate on this in the next section.

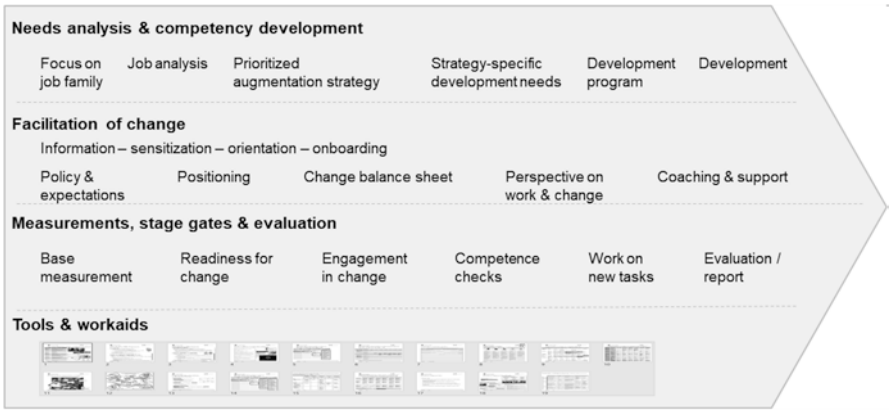

Fig. 5.4 Four intersecting work streams in applying augmentation strategies for workforce development. (Adapted from Meier et al. 2019, p. 835)

5.5 The Contribution of Human Resource Development

In the previous sections, the following argument was developed: With smart machines spreading in the workplace, an important aspect of moving toward a learning organization is a HRD process oriented both to the potential of and to the requirements for productively working with smart machines. We argue that HRD needs to be aware of the importance of fusion skills as well as augmentation strategies and needs to be able to systematically develop these.

What does all this mean for HRD and HRD professionals? In order to clarify this, we build on the conceptual distinction of three levels of HRD-specific competences developed by Martin and Grudziecki (2006, p. 255):

- Level 1: competences related to digital transformation and smart machines at the level of individual contributors in HRD.
- Level 2: capabilities related to digital transformation and smart machines at the level of the HRD function.
- Level 3: capabilities related to supporting digital transformation and learning at the organizational level.

Proceeding from the representation provided in Fig. 5.5, the question is: Do HRD professionals have the competences (level 1), and are they collectively capable of driving the HRD function (level 2) in order to facilitate transformation and learning at the organizational level (level 3)?

For 3 years now, we have been conducting survey research that sheds light on this question (Seufert et al. 2019a; Seufert et al. 2020, p. 61). This research, which has been carried out in Germany, Switzerland, and Austria, specifically investigates

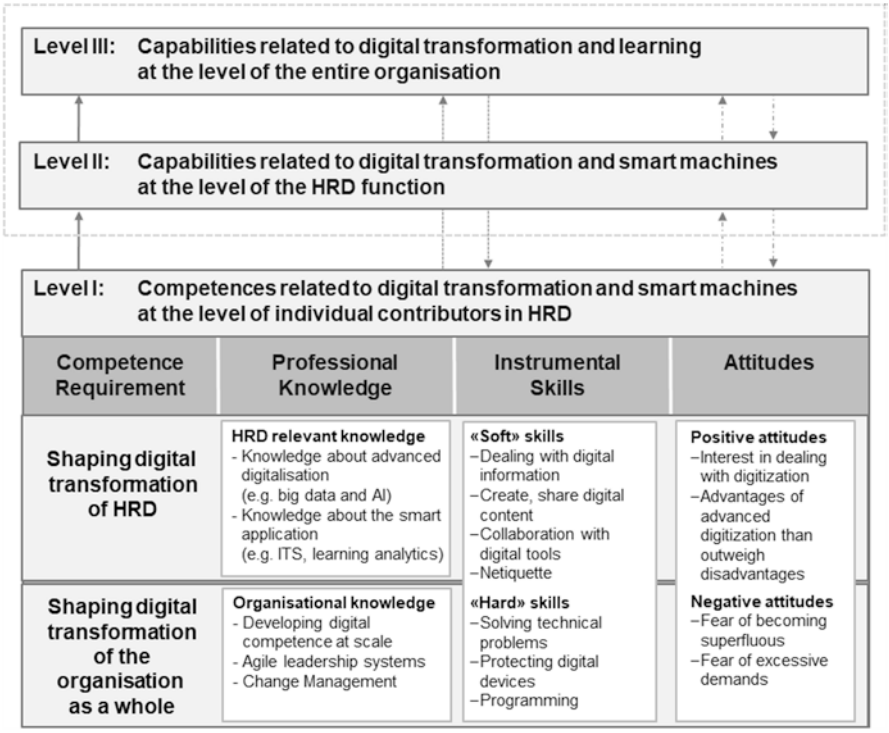

Fig. 5.5 Three levels of transformation. (Adapted from Seufert et al. 2019)

the state of digital transformation in the people development function, the status of learning professionals with regard to knowledge on advanced digitalization, their attitude toward digital transformation, and the augmentation strategies they see for themselves. In these studies, HRD professionals from industries such as manufacturing, financial services, public administration, logistics, IT, and telecommunications participated (225 in 2018, 160 in 2019). HRD professionals from manufacturing, financial services, public administration, logistics, IT, and telecommunications as well as several other industries participated.

With regard to the question as to whether or not HRD professionals have the competences and capabilities to drive and support digital transformation at the three levels pointed out above, two results of this research are particularly relevant. One relates to the knowledge of learning professionals on aspects of advanced digitalization in the domain of talent development. As can be seen in Fig. 5.6, HRD professionals mostly regard their knowledge about these aspects as not yet fully developed.

This result may indicate that HRD professionals are not yet able to implement development programs focused on augmentation strategies – not the least because they may not fully understand the dimension of change. However, other results from this research reveal that HRD professionals indeed see themselves as up to the task of moving their organizations forward. One is that a large majority of HRD profes-

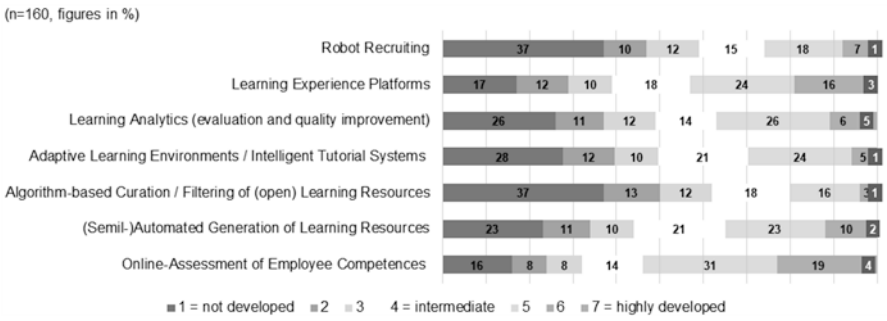

Fig. 5.6 Self-assessment on knowledge relating to aspects of advanced digitalization in talent development. (Source: Seufert et al. 2019b, p. 14)

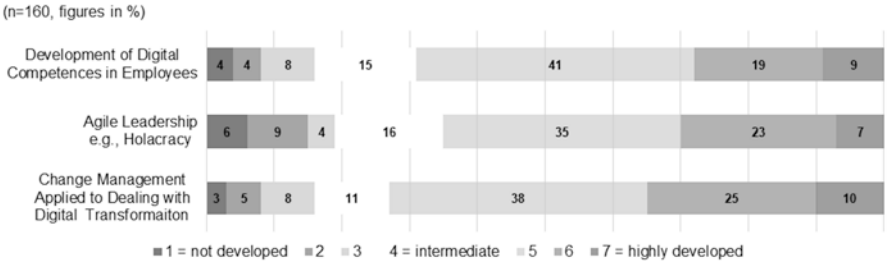

Fig. 5.7 Self-assessment prompted by the following stimulus: "How do you rate your knowledge regarding the following methods and procedures?" (Source: Seufert et al. 2019b, p. 15)

sionals have positive attitudes toward digital transformation and do not feel threatened by it. The other is that they mostly see themselves as capable of supporting the development of digital capabilities and digital change (see Fig. 5.7, top and bottom item).

While talent development professionals may not yet fully appreciate the dimension of change resulting from smart machines coming to the workplace, they are nevertheless open to this change and also see themselves as capable of (1) developing digital competences in employees and (2) supporting change related to digital transformation.

As part of this survey research, we have been asking HRD professionals directly about how they position themselves with regard to augmentation strategies. After all, AI-driven solutions such as intelligent tutoring systems or chatbot-based learning environments are gaining momentum in the field of human resource development. In order to enable a well-founded positioning, a short explanatory text and a table with a characterization of the five augmentation strategies were provided. Two items each operationalize the five augmentation strategies. Examples of these question items are the following (items are translated from German):

- "I see my responsibility in HRM in the productive use of AI-based solutions in the process of people development work" ("step in").

- "I see my responsibility in HRM in the evaluation of currently available augmentation solutions for HRD work" ("step up").
- "I see my responsibility in HRM in offering development consulting for employees" ("step aside").

With regard to augmentation strategies, HRD professionals currently favor a "step aside" strategy for themselves. On average, more than 80% of talent development professionals participating in the survey see their activities in line with this strategy. The "step up" strategy is ranked in second place, followed by "step in" and "step forward"; see Fig. 5.8.

In this vein, a critical point could be the validity of the HRD professionals' self-assessment with regard to – on the one hand – supporting digital transformation and – on the other hand – their readiness for pursuing relevant augmentation strategies. For example, "step up" emerges as an augmentation strategy that HRD professionals regard as highly relevant to their work (ranked in second place). Yet, we see this strategy as one that is feasible for only a few persons as we expect the demand for work and expertise regarding the evaluation of smart machines and their management as rather limited within organizations – at least compared to the demand for roles that practice "step in" or "step aside." In order to resolve this, more research is required. The challenge is that the concepts of fusion skills and augmentation strategies are new and rather abstract. Therefore, it may be a challenge to ensure a valid self-assessment.

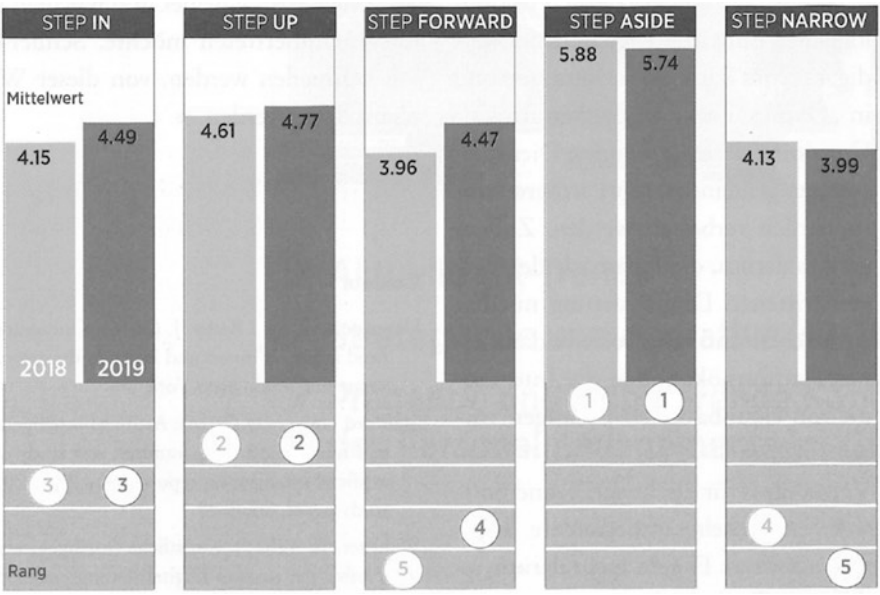

Fig. 5.8 Preference ranking of augmentation strategies for talent development professionals. (Source: Seufert et al. 2020, p. 61)

5.6 The Learning Organization in the age of Smart Machines

The point of departure for this chapter was the following understanding of a learning organization: "The learning organization is one that learns continuously and transforms itself. Learning takes place in individuals, teams, the organization and even the communities with which the organization interacts. Learning is a continuous, strategically used process - integrated with, and running parallel to, work" (Watkins and Marsick 2019, p. 53). Against this backdrop, we have developed the following sequence of arguments in this chapter.

In the literature on the learning organization, the role of technology has mostly been limited to it providing "knowledge freeways" and infrastructures to support exchange of information, collaboration, and access to learning resources. What is missing is an appreciation of the relevance of two intertwined loci of learning in organizations: (1) advanced digital systems ("smart machines") and their ever-growing capacity for carrying out tasks and (2) the interaction of employees with these smart machines.

Smart machines are able to perform narrowly defined tasks by themselves, and they are continually becoming more powerful. The real potential lies, however, in the productive collaboration of humans and smart machines. This collaboration takes the form of hybrid activities where humans complement smart machines and smart machines boost human capabilities. Hybrid activities are an important driver for organizational performance.

A prerequisite for hybrid activities and the performance they make possible are what Daugherty and Wilson call "fusion skills" (Daugherty and Wilson 2018). These comprise skills such as shaping the perception of smart machines in a responsible way, passing judgments on the performance of smart machines and taking appropriate decisions, intelligently interrogating smart machines in order to tease out meaningful analytic results, working "hand in hand" with smart machines, and reciprocal apprenticing.

The availability of such fusion skills cannot be taken for granted. Rather, fusion skills need to be diagnosed and – if lacking – developed. A relevant framework for developing these and other skills related to smart machines is "augmentation strategies" as coined by Davenport and Kirby: "step in"; "step up"; "step aside"; "step forward"; and "step narrow" (Davenport and Kirby 2016).

Preparing entire job families (1) for the very different production and service processes that are possible with smart machines, (2) for productive collaboration with smart machines, and (3) for continually changing competency requirements (after all, these machines are continually becoming more powerful) is a major challenge for any organization. It is a challenge that marks a moment of truth with regard to coping with dynamic change and also with regard to being a learning organization.

This challenge is multi-faceted. It requires an understanding of key concepts such as fusion skills and augmentation strategies. It also requires performance in

several interrelated groups of tasks: needs analysis and competency development; facilitation of change; measurement and evaluation; and, finally, appropriate use and adaptation of tools and work aids. This challenge is located in the realm of HRD professionals.

As current research indicates (Seufert et al. 2020), HRD professionals in German-speaking countries rate their own knowledge on aspects of advanced digitalization in the domain of talent development mostly as not fully developed. Hence, the question emerges whether they already are positioned as effective supporters of a move toward a learning organization in a context where smart machines are becoming increasingly prevalent. However, research results also indicate that HRD professionals see themselves as up to the task, in particular because they see themselves as capable of supporting the development of digital capabilities, more agile organization, and digital change.

In order to foster the move toward a learning organization in a digital age characterized by increasingly powerful smart machines, HRD professionals may need to follow three steps: Firstly, they need to better understand smart machines, fusion skills, and augmentation strategies as well as their implications – at a personal level as well as at a team and an organizational level. Secondly, they need to establish effective practices at the level of the HRD function so that HRD professionals themselves can make effective use of and respectively can effectively collaborate with smart machines in their immediate work context – for example, intelligent tutoring systems or learning environments supported by chatbots. Thirdly, they need to make available these capabilities to the entire organization in order to support – where required – the move toward a learning organization in a digital age.

Besides these challenges for HRD professionals, there are, however, also challenges for research and development in this area. In particular, more research on fusion skills and augmentation strategies is required. How to operationalize and to validly and reliably diagnose fusion skills? How to operationalize and diagnose augmentation strategies? How to develop and evaluate tools and processes that support both the development of fusion skills and augmentation strategies? These are interesting times and it is unlikely that HRD runs out of challenging tasks.

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Chapter 6
The Concept of a Digital Twin and Its Potential for Learning Organizations

Angelina Berisha-Gawlowski, Carina Caruso, and Christian Harteis

6.1 Introduction

One of the characteristics of a learning organization is the ability to self-evolve. It is, however, short-sighted to understand this self-evolving strength as a capability to only react to changing market conditions. "Anticipation," "pro-activity," and "being ahead of time" are buzz words that are often used to emphasize that it takes more for organizations to survive on the market. They underline that reacting alone may not be enough. Surviving may not be enough.

The major challenge nowadays is mastering the digital transformation. In the industrial sector, the digital transformation of organizations is primarily driven by the opportunity to increase productivity while simultaneously reducing costs through integration into a cyber-physical system. One way to fully tap the potential of a cyber-physical system is the concept of the digital twin and the real-time digital representation of machines and resources involved – including human resources. The vision of representing humans by digital twins primarily aims at increasing economic and technological benefits: errors are avoided, capacity is exploited more efficiently, and time to market is significantly reduced. In the case of machines, these objectives can be achieved, for example, by computing their technical specifications such as functionality, performance data, and maintenance requirements or intervals in the digital twin. In order to achieve efficient planning of human resources, similar *specifications* of humans must be used. These can be data on job, qualification, and skill profile, certainly also data related to performance, e.g., the amount of time required to perform certain activities. This justifiably raises questions of overarching monitoring and control that cannot only be addressed from a legal viewpoint. An educational perspective is needed to answer the question as to how this new and extended *transparency* of humans affects their learning. Another

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_6

challenge is to model human skills in the digital twin, so that these data serve automation purposes. In addition to that, it should be much more interesting to consider that, in contrast to machine capacities, human skills are a dynamic factor and ideally grow over time. Humans ideally learn at work, their skills grow, the expertise deepens, humans evolve, and they learn to deal with novel challenges. Specifically when looking at informal and unintentional learning, a particular human characteristic comes into play: the human ability to deal with ambiguity, vagueness, and uncertainty. The human digital twin must therefore be designed to capture and, above all, support human learning and their further development in order to realize the organization's ability to self-evolve.

In this article, first, the characteristics of the learning organization are described in Chap. 2. The learning organization concepts considered there emphasize the importance of team learning. The third chapter provides definitions of the digital twin and the view of what objectives the digital twin should achieve and how this can be done. The fourth chapter brings together and discusses both views – that of the learning organization and that of the digital twin concept. The aim here is to clarify which educational requirements should be taken into account in the design of the digital twin in order to achieve a working environment that is conducive to learning when using the digital twin and which constellations, on the other hand, can stand in the way of it. The article closes with a discussion and an outlook on further proceedings.

6.2 Approaches to the Learning Organization

Only organizations that change will remain – a truism that may be reread in any management and leadership manual. Change is vital because the market changes constantly: new competitors appear, customer needs change, new products are launched, laws and regulations are adapted, technology advances, and complexity grows – these are just a few examples for many possible changes that organizations face. Everything else is in motion so organizations must likewise keep moving. What may sound like stating the obvious fact still remains to be a great challenge: The imperative of change is in fact an imperative of learning because learning is at the heart of change.

6.2.1 Learning to Change, Changing to Learn

Respectively, theories of the learning organization revolve around the organization's ability to change. Argyris and Schön (1996) coined the term organizational learning and tied their understanding of the quality of learning to the quality of change: Only far-reaching change – that lead from correcting specific errors to reassessing underlying theories and, finally, to redefining the organization's learning

system itself – enables organizations to go beyond and ensure growth and development. Change plays a main role in the concept of the learning organization by Senge (1990) as well; it is rooted in a power of creation that enables an organization to draw an impact on itself and its environment. In his concept, teams are the place where organizational learning effectively takes place. Kim et al. (2017) emphasize the importance of steadiness and consistency of change and affirm continuous learning as the main enabler for organizational learning. In the works of Garvin et al. (2008), organizational learning is regarded a strength of great importance, simply out of the fact that what needs to be learned is unpredictable and therefore most challenging.

6.2.1.1 Learning as Change from within

According to Argyris and Schön (1996), organizational learning basically occurs when a mismatch between action and outcome is resolved, but it is the depth of change that makes the difference and leads to the distinction of three types of learning:

- *Single-loop learning* occurs when individuals detect errors and correct them by taking appropriate action with direct problem-solving effect. No further action, however, is taken as to ask for the *why* of the error nor are governing procedures and policies changed. The knowledge about how to correct the specific error remains at the individual level. The organization's overall objectives and its strategy remain untouched.
- *Double-loop learning* on the other hand goes beyond: It involves modifying those same policies and procedures. Changing organizational structures and strategy is not a task that can be accomplished by the individual alone. It means to address and discuss the initial error with others, to come up with ideas for new procedures and to implement appropriate change which then will be communicated with the affected parties or throughout the whole organization. Learning, then, exceeds the individual realm and benefits the organization. Knowledge transforms from individual to organizational knowledge.
- *Deutero-learning* – the term is borrowed from Gregory Bateson's understanding of second-order learning, i.e., learning how to learn. It occurs when organizations understand how single-loop and double-loop learning works. Deutero-learning changes the learning system itself and enables organizations to create a framework that specifically promotes learning.

In this sense, organizational learning challenges the individual learner to question what they do and why they do it as an individual but also on behalf of the organization as a whole. This can only be done by confronting with one's own actions and the underlying theories as well as by seeking the confrontation with those of others. Only then, individual learning results are inscribed in the organizational learning system.

6.2.1.2 Team Learning

Senge (1990) considers learning a phenomenon that comes natural to the individual and concludes, therefore, that an organization also can learn, i.e., be a learning organization. However, the organization's ability to learn is subject to the influence of organization-specific characteristics that determine how and what is learned. In fact, only the mastery of five – as Senge calls them – disciplines enables an organization to learn; their negligence on the other hand hinders learning:

- *Systems thinking* is founded on the basic understanding that organizations are complex systems. A learning organization is characterized by its ability and its efforts to reach a deep comprehension of how actions, behaviors, and events are connected to each other and that not only visible but also non-visible processes exert their influence. The unique character of an organization's system is reflected in a symbolic, formal language, in behavioral patterns. They need to be thoroughly assessed before effective solutions of existing problems may be reached and, respectively, before effective learning may take place (Senge 1990; Senge et al. 2004; Watkins and Kim 2018).
- *Personal mastery* refers to the individual's personality development and is characterized by continuous striving for growth and by recurring reflection of one's own abilities, which in turn can have an influence on the individual's work in the organization. The individual's continuous personal development contributes to the organization's further development. To excel in this discipline, personal mastery is understood as a lifelong process and encompasses two main activities: First, a clear idea of what (goal) is important and why (for what purpose) and, second, a constant reality check, which shows the current position in relation to those goals and purposes being pursued. Central to the idea of achieving personal mastery is the free will; one cannot be forced to it (Senge 1990; Senge et al. 2004).
- *Mental models* enable to critically reflect on unconscious, unquestioned, and often tacit presuppositions. Mental models control individual actions. Essential for learning is the understanding of one's own mental models and the realization that they are not an accurate representation of reality. For a learning organization, it is crucial to recognize the unsystematic yet influential nature of mental models and to understand that they differ from person to person. Efforts to raise awareness of one's own mental models and reaching an understanding with others despite their different perspectives foster learning (Senge 1990; Senge et al. 2004).
- *Shared vision* promotes creativity, eagerness to experiment, and courage. It opens up new ways of thinking and acting by bringing together and sharing different viewpoints. It closely corresponds with the discipline of personal mastery by opening up for the individual goals and purposes. A learning organization offers opportunities to clarify individual visions, goals, and purposes, to negotiate them and finally to co-create a shared vision (Senge 1990; Senge et al. 2004).

- *Team learning* values dialogue and discussion in balance. Dialogue pursues the goal to enrich the common understanding and to give the individual the opportunity to overcome their own limits of understanding. At this point, agreement is not the issue but discovering new aspects. Discussion serves the goal to find alignment and reach a decision. Both forms of discourse – dialogue and discussion – are characterized by respect, honesty, and openness. Teams may shift from one form to the other back and forth as seems appropriate and at the team's pace. Teams should be aware of group dynamics that undermine learning such as superficial consent or oppressed thoughts. They are therefore free to define their own rules and take appropriate action if those rules are not adhered to. A learning organization considers teams as the "place" where organizational learning eventually and effectively takes place (Senge 1990; Senge et al. 2004; Watkins and Kim 2018).

A learning organization is a complex system consisting of individuals who are no less complex in themselves and whose actions are an equally complex process. In this view, learning must be seen as subject to the influence of various interdependent factors. These factors sometimes reinforce each other or are in conflict with each other. Therefore, individual learning beneficial to organizational learning cannot be taken for granted. It can only be cultivated in the encounter of individuals collaborating effectively in teams where individuals express explicit and tacit influence factors and collaboratively work on common solutions.

6.2.1.3 Continuous Learning and Change

A learning organization according to Watkins and Marsick (1993) is characterized by processes, structures, and practices that are at all levels directed toward learning: individual, team, organization, and society. Training is an important factor in a learning organization, but its importance is surpassed by informal learning, that kind of learning that takes place when carrying out work-related activities. When learning and working are intertwined, learning occurs on a continuous basis and creates likewise continuous change with an impact not only on the individual and on teams but on the organization and eventually on society as well. Learning individuals change their view of the organization and give a new meaning to their work. This in turn demands the work and the organization including its perception by society to change. A learning organization is built on the following imperatives:

- *Create continuous learning opportunities* by designing work in such a way that learning may be accomplished while working and by offering ongoing education.
- *Promote inquiry and dialogue* in order to give the individuals the opportunity to express their perspectives while at the same time listening to those of others. This includes asking questions, giving feedback, and experimenting, all of which are explicitly supported and valued.

- *Encourage collaboration and team learning* by empowering groups to access different modes of thinking so that working and learning go hand in hand.
- *Empower people toward a collective vision* by enabling them to jointly engage in vision creating, i.e., setting objectives, owning, and implementing them. Responsibility is allocated where decisions are made so that individuals are able to take responsibility for their actions.
- *Connect the organization to its environment* so that the interdependency between the organization and its environment becomes clear which enables the individual to understand the impact of their actions on society and the impact of society on their actions.
- *Establish systems to capture and share learning* by explicitly defining learning as an organization's objective assisted by appropriate technological systems. They are used to create learning opportunities and to disseminate learning content.
- *Provide strategic leadership for learning* by nurturing a leadership culture that views learning as a strategic asset and uses it. Leaders are keen to model, advocate, and support learning (Kim et al. 2017; Marsick 2013; Marsick and Watkins 2003; Watkins 2000; Watkins and Kim 2018; Watkins and Marsick 1993; Yang et al. 2004).

Organizational learning is a continuous learning, rather a steady process than a one-time event, e.g., due to a specific need for change. What is special about this view is that it emphasizes the exploration of the unknown as a primary characteristic of learning.

6.2.1.4 Specific Activities Fostering Individual Change and Learning

Learning is a phenomenon that, like change, is continuous. In this sense, one may state that organizations are learning organizations by nature. Two aspects, however, get in the way of this first conclusion: *On the one hand*, learning at the individual level is limited to its effects to the individual level, if learning results do not lead to a change of individual behavior. Furthermore, the organization benefits from individual learning results only when shared, discussed, and jointly exerted. *On the other hand*, the *what* of learning is an important aspect, too. Learning in a constructivist sense is subject to many different influence factors and is therefore also to be regarded as subjective experience with an open outcome. For example, learning to speak openly about one's own mistakes and, thus, enable others to learn from them as advocatory mistakes (Oser et al. 2009) requires a supportive organizational environment. Otherwise, individuals tend to hide mistakes in order to avoid sanctions, and a repetition of the same mistake becomes probable (Harteis et al. 2008).

Individuals' informal learning at work is a matter of fact that cannot be avoided at all. However, for an organization, it is crucial that individual learning leads to change of behavior, practices, and thinking. The 3-P model of workplace learning by Tynjälä (2013) provides a comprehensive overview of the complex interrelation

between individual learning and its influence factors determining whether behavior is maintained or changed. In this model, the specific *activities* at the individual level are the result of a negotiation between *learner factors* such as prior knowledge and *learning context* such as organizational structure. But before any action is taken, the individual's *interpretation* determines if and how the individual engages in activities beneficial to learning. These activities create *learning outcomes* at an individual and organizational level and in turn – closing the cycle – shape the input factors: learner factors, learning context, and interpretations. This cycle is overall governed by the surrounding *sociocultural environment* including values, policies, and customs in a society with an effect on the organization.

6.2.2 Conclusion

The learning organization cultivates learning. It seeks to understand what needs to be learned and how it is accomplished. It values and realizes change as a result of learning at both the individual and the organizational levels. Errors are an opportunity to rethink current practices and the structures behind them in order to adapt and change them. Being aware of its own complexity, the learning organization strives for a deep understanding of existing interrelations and seeks for a reflection in an overall context. Individual perspectives, interpretations, and experiences – from in- and outside the organization – have a significant influence on learning. Efforts are made to reach an awareness and understanding of these influence factors and their effect on action. The learning organization provides sufficient space for exchange and various forms of collaboration and interaction – such as networks, think tanks, and teams – that may exceed organizational and disciplinary boundaries. Teams are considered as *power plants* that are able to transform individual learning into organizational learning, provided that they are granted extensive autonomy. Teams are enabled to share individual thoughts and ideas, on the basis of which they freely co-create visions, objectives, and purposes for the organization. Work itself is regarded as a place of learning and therefore encompasses activities that promote learning. In addition, this includes reflection and evaluation of one's own actions compared to the objectives to be achieved.

6.3 The Digital Twin

In the production system, digital technologies allow the integration and interconnection of the involved resources and processes by connecting them with each other via the Internet using sensors and actuators. This enables sensing, monitoring, and controlling remotely and in real time (Kritzinger et al. 2018). As the virtual equivalent of the physical system, a digital twin "can be used to simulate it for various purposes, exploiting a real time synchronization of the sensed data originating from

the field-level and is able to decide between a set of actions with the focus to orchestrate and execute the whole production system in an optimal way" (Kritzinger et al. 2018, p. 1016). Josifovska et al. (2019) consider the digital twin "as one of the main enablers for digital transformation" (p. 403).

6.3.1 Approaches to a Definition of the Digital Twin

The concept of the digital twin is still in its infancy. The understanding of what the digital twin is and what it is supposed to do varies depending on the perspective of the regarded research. With a focus on the industrial sector and therein on manufacturing, a digital twin combines information of a machine, for example, in such a way that its properties and functions are digitally represented in the virtual world as they appear in the real world. "Mirroring" (Grieves and Vickers 2017, p. 93) was the term to which the attempt of virtually representing physical objects initially referred; moving on to the use of the term digital twin is due to the fact that today's advanced technologies allow a more integrative and reciprocal link between the virtual and real world. Characteristic and distinct feature of the digital twin is the automatic exchange of data in both directions via this link: from the digital twin to the real object and from the real object to the digital twin (Grieves and Vickers 2017), this feature distinguishes the digital twin from the digital model (only manual data exchange in both directions) and from the digital shadow (automated data flow from the real object to the digital shadow but only manual data flow back) (Kritzinger et al. 2018). The digital twin "emphasises interaction, communication and collaboration between physical space and cyber space" by creating meaning out of the exchanging data (Tao et al. 2019).

However, regarding the question of with what kind and with what amount of data the digital twin should work, the current ideas differ. Grieves and Vickers (2017), for example, understand the digital twin as "a set of virtual information … that fully describes a potential or actual physical manufactured product from the micro atomic level to the macro geometrical level" (p. 94) and that ideally any information is obtained. Glaessgen and Stargel (2012) develop a definition derived from their work in the aviation sector, which nevertheless illustrates the great potential of the digital twin also in general: "A Digital Twin is an integrated multiphysics, multiscale, probabilistic simulation of an as-built vehicle or system that uses the best available physical models, sensor updates, fleet history, etc., to mirror the life of its corresponding flying twin" (p. 7). In terms of data quality and quantity, they argue to take into account all possible cause-effect interrelations including adjacent processes such as "on-board integrated vehicle health management (IVHM) system, maintenance history and all available historical and fleet data obtained using data mining and text mining" (p. 7). "The digital twin is not a data monster, which includes everything from all lifecycle phases," however, is the position of Boschert and Rosen (2016), who tie the criterion of comprehensiveness of the digital twin to the criterion of usefulness; they state that the "general vision of the digital twin refers to a compre-

hensive physical and functional description of a component, product or system, which includes more or less all information, which could be useful in later lifecycle phases" (p. 66).

In summary, the digital twin can be understood as a means to virtually mirror the automated production system and to work with the extensive data generated and processed there in. These data contain useful information to be exploited for further automation and for increasing productivity but also for realizing quality objectives. They are put into context by the digital twin and are thus operable for the achievement of the abovementioned goals. Opinions differ as to how much data is needed: The extensive understanding of the digital twin demands all available data, the lean approach, however, operates with useful data only.

6.3.2 Purpose of the Digital Twin

6.3.2.1 Technological Purpose

From a technological point of view, the main advantage is that with today's means large volumes of data can be processed in rich variety in real time. Different types of data from different sources are brought into consistency. This data is used to improve production by accurately planning and executing all production steps including upstream and downstream processes such as supply as well as maintenance. Deviations and anomalies at any level can be managed quickly and thoroughly. Processing the data for the purpose of simulating different scenarios opens up new possibilities for improving production. Working with probabilistic data allows to predict possible failures and helps to be prepared for unexpected events. By taking a holistic view of the entire value chain, experiences from all phases can be used in all phases: For example, efforts in service and feedback from customers can be taken into account in product development without much delay. Improvements can thus be implemented quickly and in a customer-oriented manner (Boschert and Rosen 2016; Glaessgen and Stargel 2012; Kritzinger et al. 2018; Tao et al. 2019). Promising potential is seen in to better understand, monitor, control, maintain, and overall improve the production process. The digital twin is also intended to support humans in making their work more creative by adding structure and meaning to the large data volume and by combining a variety of data in experimental scenarios (Boschert and Rosen 2016; Tao et al. 2019).

6.3.2.2 Economic Purpose

An undisturbed data flow and the targeted use of data make a decisive contribution to productivity, a significantly reduced time to market, and an optimized product design. The digital twin works with data from different systems and makes it available to the specific phases of the product life cycle. In this way, simulations can

be run in all phases to achieve the optimum process. It is modular and provides standardized interfaces, analyzes historical and real-time data with the help of algorithms, and has a well-defined structure that allows later upgrades and a constant evolution along the value chain. Data from early phases are used to optimize downstream phases; data from downstream phases are in turn used to optimize the upstream phases. They then serve for a faster design and launch of adapted or new products and procedures. By realizing not only cost but also competition and market advantages, the digital twin generates added value along the whole value chain. Of the extensive data, only those that can be considered essential are condensed into relevant information within the digital twin. Properties, activities, and events that are not used for streamlining the production system will not be taken into consideration. Thus, the digital twin can be described as a lean model and can be regarded as a means to increase overall efficiency (Boschert and Rosen 2016; Kritzinger et al. 2018).

6.3.3 The Digital Twin for and of Humans

In order to explore the potential of the digital twin, a consideration from a human perspective is important in two ways.

One perspective sheds light into the situation where humans work with digital twins to control and manage a cyber-physical system. Here it is to be considered that the increasingly digitally integrated production process confronts humans with a significantly changed work situation. The changes are different depending on the area of work. The area of product development, for example, benefits from the possibility of simulating the properties of planned products instead of testing them in a time-consuming and costly manner. The end user's experience with an already existing product provides an enriched view on how the product can be further developed. The integration of information from adjacent work areas such as purchasing, controlling, etc. can also ensure that changes to the product are simulated in multiple perspectives and thus checked for their usefulness at an early stage. Seen in this way, the digital twin contributes to an enrichment of the work located there. Furthermore, by bringing together information from different areas of work, an effective communication is especially required. A common understanding that transcends disciplinary boundaries will become increasingly important if effective cooperation is to succeed (Gräßler and Pöhler 2017; Tao et al. 2019).

The work situation in production itself, however, faces changes of a different quality. The digital twin contributes to an increasingly automated production process, rendering certain human activities obsolete. Not only dangerous and monotonous work is subject to substitution but also planning and evaluative activities. Also, decisions on the allocation of tasks, for example, are more and more being made by computer systems. This will lead to a shift of human work from performing to

monitoring. In addition, the use of sensors and assistance systems to check the correct execution of work steps can easily be used for surveillance purposes (Gräßler and Pöhler 2017). In the case of inaccurate and erroneous data resulting in erroneous decisions, it will become necessary for humans to recognize these errors and be able to correct them and overrule the computer system. This requires new skills (Nokelainen et al. 2018; Tao et al. 2019).

Another perspective to be considered is the human digital twin, i.e., the representation of humans in the virtual world. Following the basic functionality of the digital twin in a technical context and applying it to humans, then such information is required which reflects the human's role embedded in the production system. The objectives pursued there – increasing overall quality, avoiding errors, and reducing time to market – apply here as well. This means that the human digital twin contains the human's specific tasks, their abilities, and probably such information that allows to tailor assistance systems to humans for a better job execution (Gräßler and Pöhler 2017). To capture real-time information, work activities performed by humans have to be recorded; to compare real-time data with historical data, these activities have to be stored. Information that describe human characteristics, abilities, and activities have to be put into a form that the digital twin can work with. Ideas are therefore needed here as to how this can be achieved. As mentioned above, human abilities undergo significant change over time; ideally, they grow. Here too, a way must be found to take account of this growth in skills, the deepening of expertise, and human creativity in the digital twin, so that the virtual human grows along with its real counterpart. Therefore, learning activities are to be planned with the help of the human digital twin. Here, the digital twin serves to help compensate for lacking skills or for qualifying purposes in order to prepare for new planned tasks for which humans do not yet possess the knowledge, skills, and expertise. Another way of enabling humans to effectively take part in the virtual world – considering "their current schedule, preferences, skills and experience" (Graessler and Poehler 2017, p. 293) – is an interactive design of the digital twin, e.g., not all decisions by the human digital twin are made autonomously, and some decisions are to be approved or even corrected by the physical human. The human digital twin is supposed to learn from this interaction and find a pattern in the human's behavior in order to emulate it and ultimately take over with autonomous decisions. The integration of humans via their digital twin is rooted in the effort to enhance the production system by leveraging valued human skills (Graessler and Poehler 2017). Which valued human skills these are is not described in detail. But if the digital twin is to emulate humans, this creates demands on the digital twin to deal with ambiguous human behavior as well. From an educational perspective, ambiguity tolerance is a central human characteristic enabling them to successfully work even with conflicting, vague, and incomplete information. As of designing a suitable digital twin in this respect, the binary logic does not suffice; algorithms are necessary that allow an ambiguous attribution of computational elements (Ansari et al. 2018).

6.3.4 Conclusion

The digital twin is a key technology for the further development of cyber-physical systems by aggregating the data into consistent relevant information and making it usable to control, manage, and advance the cyber-physical system. To unfold its full potential, the design of the digital twin takes the complex interrelations within the cyber-physical system into account. The specification of clear objectives and purposes is furthermore necessary in order to decide which data have to be processed for which purposes and in what manner. Thus, it has the potential to make the system as a whole more flexible and better manageable. The question as to how the digital twin may support human learning – whether as *operators* of machines controlled by digital twins and whether as *controllers* of their own digital twin or *controlees* by their digital *self* – will be discussed below.

6.4 Learning with the Digital Twin

Organizational learning depends on human learning. Humans learn continuously, not only in purposeful structured learning situations but also all the time. They are constantly engaged in perceiving their environment as well as their own internal processes and relating both of them to each other. In this way, they make sense of the environment and of themselves being part of it and to seek to exert influence on both. A learning organization supports individual learning and encourages team learning. It creates the necessary freedom for change as a result of individual and team learning and allows this change to affect the organization itself, its structures, processes, and self-conception. The digital twin is expected to significantly advance cyber-physical systems, but will it bring the learning organization to the next level as well? Tynjälä's (2013) 3-P model of learning at the workplace (see Fig. 6.1) takes into account the above-elaborated characteristics of a learning organization; specifies preconditions (presage), activities (process), and results (product); and considers surroundings (sociocultural environment) influential to learning. It is therefore an appropriate foundation for the discussion whether and how the digital twin influences human learning.

Following the idea that learning and working ideally should be intertwined, we will first look at the *activities* assigned to the *process* phase, namely, *doing the job itself*:

The idea of how the digital twin may support informal learning while working is pursued, for example, when its potential for meaningfully structuring an otherwise unmanageable and overwhelming data volume is discussed, even if this feature is not explicitly described as beneficial to learning (Tao et al. 2019). Reducing external or inefficient cognitive load (which occurs when dealing with irrelevant tasks) in favor of relevant or effective cognitive load – which activates cognitive resources, helps retrieve knowledge from the long-term memory, and enables to recognize

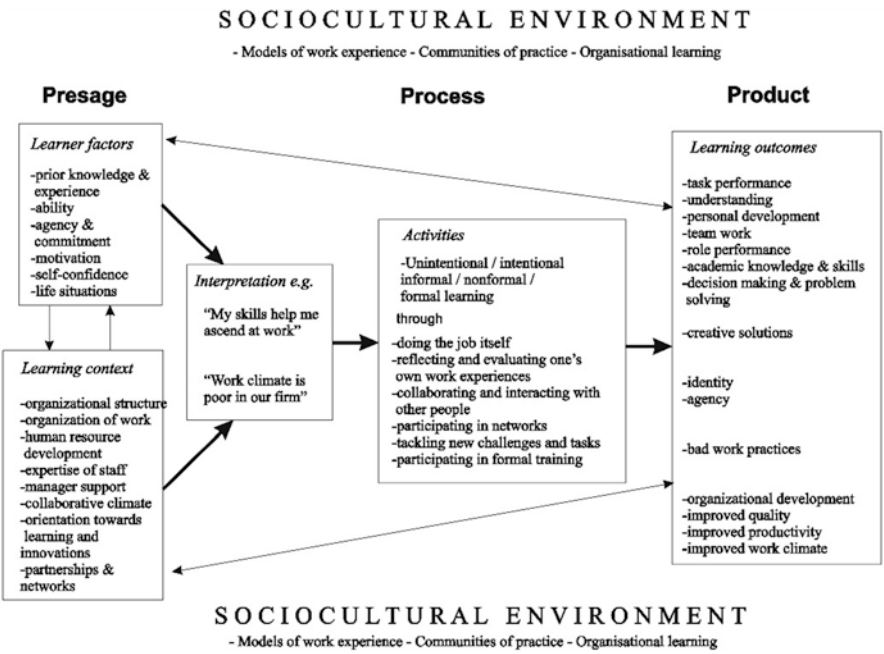

Fig. 6.1 The 3-P model of workplace learning from Tynjälä (Tynjälä 2013) Reprinted by permission from Springer Nature: Toward a 3-P Model of Workplace Learning: a Literature Review by P. Tynjälä, 2013, *Vocations and Learning, 6*(1), p. 14. Copyright 2013 by Springer.

patterns and build routines – fosters learning and expertise development (Paas et al. 2003a, b). The core question here is whether the logic of aggregating and structuring the data by the digital twin corresponds to the human mental model or deviates from it and how the one or the other is to be viewed. Also of interest is the extent to which the digital twin is able to respond to the varying human capability to cope with cognitive load depending on various influence factors: Attention, emotions, and environmental stimuli can exert a positive or a negative effect (Pekrun 2018; Schwarz 2019).

For developers of the concept or a framework of the digital twin in the fields of mechanical engineering, systems engineering, or computer science, it can be assumed that working on the digital twin enables learning. For the following reasons, defining the appropriate mathematical models and algorithms for the digital twin to combine the huge amount of data into meaningful, sufficient, and relevant conclusions is a task that requires both deep expertise and creativity on the designer's part. The digital twin offers a task rich of learning. Once the architecture has been defined, the question arises as to how much freedom the digital twin offers to its user.

Reflecting and evaluating one's own work experience: The digital twin is supposed to enable humans to participate in the cyber-physical system, to control, and

to manipulate it in order to ensure high data quality, to give one example (Graessler and Poehler 2017). Regarded as an integral part of the cyber-physical system, humans should be given the opportunity to manipulate their own digital twin and to work with their own performance data in order to reflect on it and to evaluate it. This would extend the notion of the human's role by providing them extensive control over their own learning and by actively working with their digital counterpart. Such a feedback feature, in fact, collides with the definition of the digital twin where data is exchanged automatically in both directions. In addition, reflecting on one's own learning on the basis of objective data only – e.g., task performance, results, and comparative data – does not consider the whole picture if emotional states and reactions – such as (dis)satisfaction, relief/stress, joy/nuisance, etc. – are left out. If and to what extent it is possible to accurately express human feelings in computable data is one question; if and to what extent expressions on feelings can be computed is the other question. Developing and working with fuzzy sets in algorithms or finding ways to combine machine and human learning are research directions that may find adequate solutions here (Ansari et al. 2018; Wang et al. 1999).

Learning also happens when errors are made. Reflecting upon errors paves the way for learning. Learning from errors enables – provided it is valued as a chance for correcting unsuitable practices and structures – the construction of negative knowledge that provides information about what does not lead to the intended outcome. Negative knowledge has the important function of protecting positive knowledge (Oser et al. 1999). However, it is a challenge to represent negative knowledge in its epistemological function for human's competencies in the digital twin.

Tackling new challenges and tasks: The possibility to run simulations with the digital twin may also be considered as a learning facilitator, as it creates room for experimenting. Thereby, space is given for choosing new challenges, finding creative solutions, and making own experiences on the way. However, the objectives of reducing the volume of data on the one hand and enabling simulations on the other hand are in conflict. A too restrictive provision of data in the sense of a lean model of the digital twin can limit potential simulations. The ability to create something new, to experiment, and to rethink old practices, however, is a central characteristic of the learning organization, of learning per se. Tackling new challenges, advancing personal mastery, creating, and innovating create competitive advantages and improve the market position (Garvin et al. 2008; Senge 1990; Tynjälä 2013).

Collaborating and interacting with other people, *participating in networks*, and *participating in formal training*: The use of the digital twin for formal training purposes is conceptualized for learning factories where the digital twin's potential to support human learning, interaction, and collaboration is researched (Brenner and Hummel 2017; David et al. 2018; Uhlemann et al. 2017).

Product phase, *decision-making and problem-solving/understanding/identity*: In the case of computer-generated decisions, humans face two challenges. First, the task of monitoring, correcting, or overriding decisions made by the computer system demands that humans understand on what the decision is based, what triggered it, and to what consequences it leads. They must understand the processes of the otherwise autonomously running operation and be able to classify deviations from

normal operation in order to take appropriate action; in short, they must know and understand the context. There is a danger that the complexity due to an increasing degree of automation becomes overwhelming (Ahrens and Gessler 2018). Second, if humans are entrusted with the task of controlling their own digital twin, for example, to set their own preferences, to assess their own learning progress, to recognize learning potential, this presupposes that humans are aware of their own learning. However, learning is not always conscious to the learner: Implicit mental models influence learning, as well as established routines may be applied without having to think about it deliberately (Harteis and Billett 2013; Senge 1990). Learning also encompasses the unplanned, unintended, and unforeseen, which is of particular importance for the development of procedural knowledge. How a digital twin can support here is to indicate possible learning goals – presupposing that the digital twin appropriately represents the individual's stock of knowledge.

Team work: With the objective of operating along the entire value chain, the digital twin covers a wide scope and acquaints the humans involved in the production process with corresponding far-reaching teamwork. However, how team learning is fostered – be it by handling the digital twin of machines or be it within the human digital twin – is widely neglected in current research. With Senge's sense of team learning in mind, where there is no organizational learning without team learning, this is an aspect that needs to be addressed. Successful teamwork is essential for overcoming limitations in thinking and is a source of creativity, innovation, and change that should not be underestimated. Teams are empowered to make decisions. Joint decisions create a higher level of commitment and a shared understanding of what needs to be achieved. A shared vision is co-created (Senge 1990; Watkins and Marsick 1993). To comprehend and to virtually model the digital twin of machines is one thing. It is challenging to find approaches how to model humans within cyber-physical systems, however, particularly if these models comprise data on learning. It is necessary to distinguish the challenge of modeling individual learning within a digital twin and the challenge of utilizing the digital twin for the support of individual learning within a learning organization. From today's perspective, it seems particularly challenging to include team learning with its characteristics and possibilities in the concept of the digital twin. Finally, inherent in the concept of the digital twin is the idea of enabling human creativity, a quality of which computer systems, at least at present, are not capable.

Sociocultural environment: The problem of a lack of context also arises when collaboration transcends corporate, national, and legal boundaries. Different learning cultures come together, which is not a new phenomenon. It has been the case for some time that global teams work together. However, if the digital twin is also supposed to support learning, the question arises as to which policies with regard to learning and which learning culture should be built in its logic. This includes different aspects that foster learning, e.g., providing feedback, error tolerance, the freedom to set individual preferences, critical thinking, etc. The underlying learning culture also determines whether these features are accepted or not and whether their specification is perceived as restrictive or lack of guidance. The learning organization is characterized by systems thinking and an awareness of its own complexity,

as mentioned above; this complexity increases when different learning cultures need to be re-negotiated. To address this problem, the digital twin may provide different features depending on the specific learning culture. Whether such an approach is technically feasible, cannot be fully discussed at this point.

Presage phase: The greatest challenge, however, for designing a digital twin beneficial to learning pose the pre-conditions of learning, especially the *learner factors* and the *interpretations* and the *learning context* to a certain extent as well. Data handling within a digital twin poses a particular challenge. What data are to be considered relevant with regard to the digital twin of a machine as opposed to that of a human? Data on the geographical position, the exact performance, the physical features of a machine, or a product are certainly to be considered useful in order to avoid idle times, to perform maintenance work, etc. They are easily obtained – compared to data on humans. Data of comparable quality on humans may be in violation of privacy which should not only be considered from a legal point of view. It also raises questions relating to learning, namely, regarding the freedom of choice, psychological safety, and dealing with errors (Garvin et al. 2008; Senge 1990; Watkins and Marsick 1993). Automatic data collection with the help of sensors may be perceived as monitoring and are easily to be misused and exploited; in certain work environments with dangerous or intense work activities, this monitoring may be considered helpful and therefore be accepted. In all cases, however, serving a reasonable purpose or not, data on employees needs to be protected.

The digital twin serves the idea of increased productivity by optimizing the whole production process and reducing time to market. This requires a certain degree of standardization. The need for determination and standardization within cyber-physical systems on the one hand and the challenge of appropriately representing individual knowledge and development within a digital twin on the other hand represent another conflict of objectives. From a technical point of view, it is possible to define functions and variables of a digital twin that determine an individual's role within a cyber-physical system. However, from an educational point of view, it is impossible to determine it in the real world – except by exerting compulsion and reducing human learning and growth to behavioristic aspects. Hence, the implementation of a human digital twin within the virtual model of an organization opens up opportunities to solve a problem within the virtual model that cannot be solved in reality. In this respect, the characteristic of the digital twin of realistically representing its real counterpart – the mirroring aspect – is not given.

6.5 Discussion and Outlook

Whether and how the digital twin can support human learning is a question that is challenging to answer. Learning depends on so many factors that cannot be easily mapped in the digital twin. Of course, measurable and observable information may be taken as indicators for learning. For example, the quality of results and the time needed to complete a task may be able to indicate a learning level. An analysis of work results over time will allow to state a progress or a decline in learning.

However, the digital twin should not only measure learning but also support it. With this objective in mind, the digital twin will have to be able to work with *invisible* but relevant learning factors such as autonomy, beliefs, cognitive processes, and emotions. Challenges can also be identified in terms of team learning. How may learning in general and learning with others be translated into computable data? Further research is needed to deepen the understanding of the interrelations of cognitive processes, emotions, social interaction, and learning.

In terms of technological complexity, the digital twin seems to be just the adequate technology. It serves to bring order into a great amount of diverse data and opens up new ways of designing the production process by combing these data in multi-variable simulations. In terms of the complexity of the learning organization, the main concern here is that the digital twin shall not violate it. The following applies to the digital twin of machines and technical systems: The more data of the physical object is available, the more accurate is its virtual counterpart, the better the mirroring. The only question here is how much effort it takes to collect the amount of data, to decide upon their relevance, and to bring into consistency. The opposite applies to humans: A most accurate and thorough representation of humans in the virtual world can show a counter-effect, since humans may perceive working conditions where extensive data on their actions and behavior are collected and stored as restrictive and controlling. Ironically, there is a risk that an excessive collection of learning-relevant data may not lead to a more accurate picture of human learning but to the *disappearance* of it. Humans may withdraw and disengage. In this regard, further investigations of what might be the right balance between human-made and computer-based decisions seem to help find promising answers.

With the potential of computer systems in general – and with the digital twin in specific – of taking over tasks formerly executed by humans, a thorough assessment is due as to what human skills are confidently replaceable. Humans are more and more expected to monitor an automated operation, not execute it themselves. The skills that they needed for operation and that they have refined over time are no longer used, but are they in fact dispensable? This is especially true in the event of a malfunction. These thoughts refer to an effect that is widely discussed as *Ironies of Automation* where skills are disused because tasks are operated by machines but then still needed for monitoring the machine-run operation, for stepping in in the event of failure and over-ruling the computer system.

In general, interdisciplinary approaches are due to find adequate solutions to the compelling questions that arise with the concept of the digital twin.

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Chapter 7
Individualizing Workplace Learning with Digital Technologies

New Learning Cultures in Swiss Apprenticeship Training

Antje Barabasch and Anna Keller

7.1 Introduction

Digital change will arrive, also at workplaces, how we cope with change will be important in the future. (Workplace trainer, login)

Workplace learning in the context of vocational education and training (VET) in Switzerland takes place in companies, VET schools and training centres. The major part of the apprenticeship is practical learning facilitated by companies and they are the most important pillar within the VET system (Gonon 2007). Often innovations in learning are transferred from workplaces into schools (Pfeiffer 2015). For enterprises, the ways in which they develop young adults for the world of work are crucial, not least to maintain firm competitiveness, because vocationally educated employees are the backbone of the economy (Häfeli et al. 2015; Finegold and Wagner 1997).

Switzerland's large majority of young adults between 15 and 17 years old (about 70% of each cohort) enrol in VET (SBFI 2019). They earn a salary that increases over the 3–4 years of apprenticeship training until the Federal VET Diploma is acquired. The dual structure of training, which can be found in Germany and Austria as well, provides early labour market experience and employment opportunities after graduation (Wettstein and Gonon 2009). Usually, hiring apprentices pays off for enterprises based on the productive work that apprentices are able to provide (Wettstein and Gonon 2009; Schweri 2019). Companies and labour market organizations profit from providing career prospects for young people, because this

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_7

secures the supply of skilled workers needed in a branch (Rupietta and Backes-Gellner 2019; SBFI 2017).

While domain-specific knowledge and skills are highly relevant and need to be acquired during apprenticeships, the relevance of personal competences, such as creativity, taking initiative and working autonomously, is increasing (Barabasch and Keller 2019a). Self-organization of work is more and more requested of workers and needs to be trained early. Regulation and control activities that originally were in the responsibility of management are handed over to workers (Heinz 2009). According to Filliettaz (2010), the organization of workplaces is a decisive factor for enabling workplace learning. Usually, learning is strong when the content is challenging, if the employees can take over responsibility and increasingly self-organize their work, and if they are hereby adequately supported (Nyhan 2009). Innovation-oriented enterprises do adapt their VET training according to these requests, for example providing flexibility and individuality in workplace training, project-based learning or new forms of learning accompaniment.

The use of digital technologies in vocational education and training (VET) in Switzerland has been reinforced by the 2020 Corona crisis. Although, education at all levels and research had strongly focused on a wide variety of issues related to digitalization (SBFI 2020), the requirement to competently work with a number of digital tools became even stronger now. Digital technology integration or adoption has become crucial not only for communication, administration and management, but it is also a meaningful asset to support learning and teaching in VET. Modern learning cultures take approaches to successfully integrate technologies in their internal processes, and in this way support autonomy and flexibility in work and learning, lifelong learning as much as intergenerational learning. They further contribute to connecting different learning sites, such as school, workplace and intercompany-training course (branch-course). While digital technology is promising to facilitate such connections, today, the facilitation of the connection of the learning sites by digital technologies is not a general standard (Cattaneo and Aprea 2018; Schwendimann et al. 2018).

The enterprises Swisscom, Login and Post in Switzerland have integrated various digital technologies in their apprenticeship training. These technologies ease administration of work hours, work tasks, evaluations or log book remarks; they support communication with peers, co-workers and trainers; and they come in handy for idea development and creative work. Overarching trends in terms of changing learning cultures in apprenticeship training, such as individualization, flexibilization, self-organized learning, project work or coaching, support the introduction of these technologies and also benefit from them (Barabasch and Keller 2019a, b; Barabasch et al. 2019). Based on three in-depth case studies in these three Swiss enterprises (Yin 2014), results on the usage and impact of digital technologies will be presented. Data were collected by means of semi-structured interviews with apprentices, workplace trainers, coaches and VET management.

This chapter addresses the following research questions: Which digital tools are used in workplace training? What are potential benefits and extended justifications for the use of digital tools? How are modern learning cultures impacting the use of

digital tools? We will outline how and where digital technologies are used at the workplace in apprenticeship training, why management has introduced them and how apprentices and their trainers benefit from it. Based on our findings, we will draw conclusions about how learning cultures are influencing the use of technologies and vice versa how the introduction of these technologies shapes innovative learning cultures in VET.

7.2 Theoretical Foundations

The use of digital technologies shapes individual as well as work-related learning and competence development and plays an important role in VET. Next to the introduction of digital technologies in formal learning, increasingly, informal learning becomes an incremental feature of digitalized work (Dehnbostel 2020). Especially, the current reinforced policy to work at one's home office may support this fusion of different life spheres. Not least, the increasing amount of mobile technologies being available enables the more flexible use of time and space (Tubin 2006). However, the flexibilization of work itself as much as the extensive work with technologies may cause various work-related troubles, such as various health and psychological problems.

Digital technologies usually rise up in different contexts and for different aims that are not necessarily educational ones. Most of the times, they are then adapted for educational purposes (Januszewski and Molenda 2008). At this time, digital technologies have entered workplace learning in many different forms, especially as production or design tools (e.g. numerical control machines, electronic measurement devices and computer-aided design software), but their use as a training tool within VET remains under-exploited. The usage of media in vocational education and training can take various forms, for example, the usage of presentation media, exchanges among students in group learning or self-study in digital learning environments (Euler and Wilbers 2020). A quite common use of technologies is to develop learning platforms or collaborative online learning spaces (Sonntag et al. 2004; Willey and Gardner 2012). Within these environments, apprentices can experience, practice, reflect and improve their ability to work with various forms of learning.

They further open up opportunities for new ways of designing and enacting learning. Research focused on location-based (or place-based) learning (Jones et al. 2013), "all the time, everywhere" learning (Norris and Soloway 2013), learning 'on the move' (Sharples 2013) and in "multiple contexts" (Mifsud 2014) (see Schuck et al. 2017). Especially using handheld devices to explore "seamless learning" tasks (Hedberg and Stevenson 2014; Rushby 2012; Toh et al. 2013) has been intensely explored, because of its possibility to support a transition of learning across contexts, often between formal and informal learning spaces. Of interest has been the "breaking away from text, time and place" (Hedberg and Stevenson 2014, p.17), connecting learning in and out of class, in and out of school, connecting learning

across curricular and extra-curricular activities, learning that is social or personal, academic or recreational, that exists in physical or virtual contexts and across times and locations (Wong and Looi 2011). "Seamless learning" helps to connect learning between school and excursion sites and provides a bridge between classroom-based tasks and more realistic fieldwork settings, or providing a transition from a personal, informal learning episode at home to learning at a later time at school.

Using digital technologies may support more independent or autonomous learning as much as cooperative learning. It is important that a general learning ability is established within apprentices so that lifelong learning is easier and individuals are inclined to keep up with new innovations (Schüller-Zwierlein and Stang 2011). Teachers are working more in the background, are less concerned with teaching domain-specific knowledge, but rather advise and coach individually (Kozma and McGhee 2003; Mandl et al. 2003; Schulz-Zander and Riegas-Staackmann 2004; Schulz-Zander 2005).

A change in learning-related values and norms can already be observed (Sonntag et al. 2004). Digital natives are quite familiar with a variety of digital tools (Prensky 2005) and develop different habits to work with them. In VET, this changing behaviour of learning on- and offline makes it easier but also advisable to accommodate teaching, workplace coaching and learning with digital technologies. This paradigm shift is an important characteristic of innovative learning cultures.

The term learning culture can be used to characterize the embeddedness of learning in the interaction among context, concept and reality (Brown et al. 1989), which refers to learning as truly being embedded within cultural settings and the utilization of cultural resources (Bruner 1996, as cited in Hodkinson and James 2003). Components of a learning culture include the learning environments as well as the practices and procedures of working and learning. In addition, it includes the study of attitudes, values and beliefs among the practitioners involved in training and of the apprentices themselves. Both are constantly influencing each other.

Culture further consists of variables, such as values, beliefs and attitudes that are common within a community and tend to perpetuate themselves, sometimes over long periods of time. It includes collective memories, long-held assumptions, common expectations and definitions (Ai-Tzu 2015). In an enterprise context, according to Sonntag et al. (2004), the learning culture is an expression of the importance of learning within the enterprise, which targets the development of competences and innovation. The learning culture is shaping individual, group- and organizational learning processes in connection with relevant framework conditions.

To summarize findings: At a normative level, learning culture is expressed through values, norms and attitudes related to learning. At the strategic level, learning culture is related to framework conditions and support for lifelong learning. At the operational level, learning cultures find their expression within the manifold forms of individual, group-based learning and organizational learning. Learning cultures are an orientation for the members of the organization in providing expectations towards the results of learning and they can be actively shaped (Barabasch et al. 2020a). Considering the usage of technologies at the normative level, questions about the ways in which technologies are used may be raised. At the strategic

level, the concern lays on work and learning conditions in respect to the usage of technologies, and at the operational level, one can analyse how technologies are used or adapted in various learning settings. All of it is not necessarily prescribed by an organization, but within innovative learning cultures would rather be shaped by its members, including the apprentices.

7.3 Method

To research the usage of digital tools in VET, three case studies (Yin 2014; Yin and Davis 2007) in Swiss enterprises that train apprentices in an innovative manner have been conducted. The three enterprises represent different sectors of the economy. The first one operates in the telecommunication industry. In Switzerland, it is the largest provider for traditional telecommunication services as well as in the provision of software solutions. The second enterprise provides VET training for apprentices that work in the public transportation sector. It cooperates with 50 partner-enterprises of the sector, for which they organize their VET training. The third enterprise is the national postal service, which entails also the two departments finance and transportation (bus).

Participants in the case studies represent the main stakeholders in workplace training at the three enterprises: Apprentices, workplace trainers, personnel that directly works with apprentices such as coaches, as well as persons representing different levels of VET management. The main data source were semi-structured interviews with persons representing all groups of people involved in workplace training (case one 25, case two 60, case three 60). Furthermore, site visits at different working (and learning) venues were conducted (case one 7, case two 18, case three 18). Data collection was completed by document analysis of VET-related documents of the enterprises. Participants for the interviews and locations for site visits were selected by the team of researchers together with a VET manager at each enterprise. The cooperation in the selection of interview partners led to a flexible continuing enlargement of the sampling in a function of theoretical sampling, leading to data saturation, respectively, to a profound understanding of the cases. The interviews followed a general interview guideline aimed at finding out about daily work, regular tasks, successes and difficulties, the organization of VET programmes, support by workplace trainers, as well as attitudes, values and beliefs regarding the workplace training. Data were analyzed by a content analysis (Kuckartz 2016). Two coders coded the entire material, supported by the software MAXQDA. The material was structured according to individual cases and categories representing different research topics (Kuckartz 2016). In an iterative process, the narratives were coded according to emerging themes and regularly discussed by the research team to ensure the reliability and validity of the data. In this way, a comprehensive and detailed system of categories was derived. The analysis of the coded segments led to a display of how digital tools are used in the workplace training at the three workplaces.

7.4 Findings

The enterprises Swisscom, Login and Post in Switzerland have integrated different digital technologies in their apprenticeship training in order to facilitate processes of workplace training. Some tools used in the specific learning and working environment of the different enterprises are developed for the training of apprentices, others are adapted to meet the specific needs in this respect. Due to large numbers of apprentices, developing digital tools for training is an economic and valuable option for these enterprises. They became particularly useful throughout the Corona crisis. All three enterprises have managed to change their working modus to digital work and home office within a few days. Login was able to move from classroom instruction to digital lessons within 2 days. Students responded very positively to it, so that the enterprise is planning to have more digital instruction in the future. The following section will first summarize the tools used in the three enterprises, then report on the experiences using communication tools, and in the third section, we explore three particular benefits of using digital tools that emerged from our data.

7.4.1 Digital Tools Embedded in the Specific Work and Training Structures

Within the Swisscom learning environment, the tool "market place" has been specifically developed for training and is a vital element of the workplaces learning culture in VET (also see Barabasch and Caldart 2019; Barabasch and Keller 2019a, b; Barabasch et al. 2019, 2020b; Keller and Barabasch 2019). Apprentices at Swisscom do not work together solely with one workplace trainer or only one internal department over the duration of their apprenticeship, as this can be the structure in other Swiss apprenticeships, but instead, they work and learn in different projects. All departments, where workforce is needed, can advertise projects for apprentices on the market place. In this way, the workforce of apprentices can flexibly be integrated where there is a need for them, an organization of workplace training that fits well with todays' fast-changing workplaces (e.g. frequent organizational and personal changes) in dynamic industries, such as the telecommunication sector (Barabasch and Caldart 2019). Today, according to VET managers of the enterprise, the market place is not only used in the VET training but serves as inspiration and is used for work organization (distribution of tasks) also for regular workers on other levels. Next to this organizational tool, the tool "eNEX" serves as a platform for the documentation of the competence development of apprentices and provides an overview about development progress, which is the base for the interaction with coaches. It further is a navigation tool for projects, that accommodate the acquisition of competences as outlined in the requirements of the training ordinance.

Login is a training provider for apprentices of the transportation sector. Apprentices work and learn at different partner firms to develop skills in various

contexts. The training enterprise hires apprentices and manages all main organizational tasks, such as communication with vocational schools or monitoring the overall development of apprentices. They also provide additional courses for developing specific competences needed in the transportation sector. At the partner firms, workplace trainers supervise and accompany apprentices by working with them on a daily basis. Partner firms profit from this organization, they have VET training outsourced to some extent, but still give the apprentices and possible future workers in their firm the possibility to gather work experience in a real workplace environment. Of course, they also profit from apprentices' productive work-outcome (also see Barabasch and Keller 2020). The organization of courses for the different occupations, the changes of workplaces between different partner firms and the accompaniment by different workplace trainers are quite complex to oversee. Login uses the tool "time2learn," which helps to cope with this complexity. It is used to document the learning progress of the apprentices and their school grades and manage their course planning, which they discuss and oversee together with their trainers. The tool is also used for communication with trainers and access to course content.

Apprenticeships at Post do not follow a common structure, but instead there are different designs and logics in the various programs. For example, in some occupations, apprentices internally change workplaces during their apprenticeship and get to know different departments of the firm; in others, the apprentices remain in one department. For some apprenticeships, it is possible to work at another enterprise for some months, to acquire certain competences, that cannot be developed internally; in other apprenticeships, it is foreseen that apprentices travel abroad for some weeks, to enhance their language skills (see Barabasch and Keller 2020).

The structural organization of training at Post calls for a specific selection and development of tools. A didactic model has been developed internally and is continuously adjusted. It builds the foundation for training courses within the enterprise aiming at a digitalization of learning. Some of the courses are already entirely digitalized; other courses remain analogue, as requested by the ordinances and curricula (the legal basis of the structure of apprenticeship training in Switzerland). The main learning platform is "Moodle." It provides access to online courses and needed digital materials and tools, but also lists presence courses, such as compliance courses. If an apprentice starts his/her apprenticeship, he/she is assigned to a class and receives an overview over the 3–4 years of training, views dates, rooms, as well as "nuggets," modules of self-study and presence-modules. There are also modules for the acquisition of additional competences, for example, in the field of leadership or project management.

The central documentation of information is one of the main reasons that digital tools are used in VET in the researched enterprises. Usually, a member of human resources (e.g. coach or trainer) advises a group of apprentices, while for the technical training, apprentices work with (different) specialists in the field. Digital tools, such as the mentioned platform "time2learn" or "eNEX," provide the possibility to oversee learning progress among the apprentices. With the overview provided online, supervisors can react quickly, if unforeseen developments occur or if a project manager or a specialist working with apprentices reports a problem.

Next to these major platforms, each enterprise operates with a number of applications throughout their apprenticeships. Apprentices use "Real Time Management RTM, SAP" to report working hours and absences or survey tools, such as "Forms" or "360 Feedback." "Office 365" is frequently used, with programs, such as "Word," "Excel," "OneNote," "SharePoint," "Planner" and "PowerPoint," for data storage, exchange of information and planning purposes. The following table provides an overview about the most common digital tools used in apprenticeships at the three enterprises (Table 7.1).

Internal IT departments are keeping up these tools, take care of upgrades and of data security. The latter can be a constraint for the usage of certain tools. For example, in the enterprise Post, the VET department is part of the human resource department and due to the sensitivity of the information processed and issues around data protection related to "Teams," this program cannot be used there. A member of the organization of the training for ICT apprentices stated:

> *We would really like to include them (the apprentices) in using Teams, but until know, this is not possible, because Teams is out in the cloud… That's difficult in our department regarding collaboration* (VET manager ICT, Post).

The example shows how internal organizational processes are not digitalized due to the lack of data safeguarding. The challenge may prevent the theoretical possible ease of communication and collaboration expected by the usage of these tools.

Above and beyond these internal complications, when it comes to the collaboration between vocational schools and enterprises via digital tools, developments are slow. Too often, information on absences of students or behavioural issues are reported in paper booklets, which apprentices, trainers and teachers have to sign. The organization and usage of digital tools is either a question of individual schools

Table 7.1 Digital tools used at Swisscom, Login and Post in Switzerland

Swisscom	Login	Post
Marketplace	time2learn (sometimes also Konvink)	Moodle
eNEX	Real Time Management, RTM	SAP solutions
Word	Word	Word
Excel	Excel	Excel
Power point	PowerPoint	PowerPoint
Outlook Mail & Calendar	Outlook mail & calendar	Outlook mail & calendar
Teams (chat function in slack today has replaced slack, which was earlier in use)	Teams	SharePoint
Planer	OneNote	Confluence
OneNote	Yammer	Starmind
OneDrive	Planner	Skype (for business)
SharePoint	SharePoint	Telepresence-rooms
Skype for business		360 feedback
Telepresence-rooms		Azure Defops
https://ch.linkedin.com/learning		Jira
MyImpact		Status meeting tool
MyContribution		Wiki
Microsoft forms		

or the organization of the canton in Switzerland. While it can be expected that the current Covid-19 crisis may speed up developments, the likelihood of enterprises reaching out to schools in their interest to ease processes, is just as high.

7.4.2 Tools Easing Communication in a Modern Learning Culture

Digital technologies facilitate and structure forms of communication in the enterprises. Chat functions are used for rapid informal exchanges ("WhatsApp") among apprentices and between apprentices and their coaches or trainers, or for official communication ("Skype for Business," "Teams"). Emails ("Outlook") are still used, although participants at Swisscom state that mail is continuously being replaced internally by "Teams." Call and video tools (Skype or "telepresence" rooms) enable conferences and help to safe on travelling. In "telepresence rooms," the communication resembles face-to-face interaction due to the use of large displays, differentiated cameras and high-end microphones. It also became obvious that there are no enforced restrictions as to which tools need to be used for communication. Apprentices can flexibly contact their trainers and coaches via phone, email or just placing an appointment for a coffee break in their calendar. Due to these spontaneous interactions, trainers and coaches can react timely and provide the support needed. However, for the trainers, the communication with different tools can be challenging, since one needs to keep track of the communications and requests on the different channels.

> *I use the phone much more than two, three years before… and there are different channels. There is SMS, WhatsApp, than we have Slack- that's another channel through which we communicate, where I have a group chat with the apprentices, about different themes. And, that is a new challenge. In the sense, that I am "bombarded" on different channels and have to handle that. When questions arrive… I sometimes don't remember, on which channel was that again? Where did I read that?* (Coach, Swisscom)

If apprentices have difficulties and need support, they can easily get in touch with individuals of their choice, such as other apprentices, experts in certain fields, external business contacts or coaches. In the enterprise Post, apprentices (as well as regular workers) use "Starmind," where open questions can be placed "in the cloud." This makes it visible for the entire network and is assigned to the department, which thematically best fits the question. The members of the corresponding department may further assign the question to a specialist who can answer it. In the enterprise Swisscom, employees have internal profiles, on which their competences are displayed and on which it is also visible, with which technologies he/she works. Apprentices, as well as regular workers can contact them, if needed.

In todays' workplaces, networking is a central element for success. Tools such as Yammer or Teams allow to establish one's own network in the firm. Building groups for exchanges regarding technologies and for the organization of project work is, for

example, also possible on the portals "Azure Defops" or "Jira," which are used for software development at the enterprise Post.

> *WhatsApp and WhatsApp class- chats are popular. Everything else often takes too much time: opening the laptop, going to a certain website, and then again opening the chat-tool on this website… everyone has a smart phone on hand, everyone responds immediately, that's easier!* (Apprentice, Post)

Some communication tools are also questioned in terms of data protection, especially "WhatsApp." Whether a tool is useful or not lies in its practicality; tools have no value in themselves. At different workplaces, it was reported that communication platforms have been established and then not used as much as expected, while other informal tools are commonly used by apprentices. Also, having a tool readily available on the smartphone increases the chances of being used by apprentices.

Apprentices, during their apprenticeship, are prepared to communicate, work and learn with digital technologies, for example using E-Learning and Web-Based Training in internal courses. Enterprises are also rolling out administration and organization of workplace training digitally as far as possible. Learning to work with digital technologies may take place "spontaneously," since apprentices learn to work with new technologies while working in an increasingly digitalized world of work. Effects of digitalization can be seen in almost every occupation, for which an apprenticeship is available in the three enterprises.

Apprentices in ICT occupations are especially confronted with high innovation dynamics and often in their work use (the always changing) newest technologies. They need to be highly adaptable and open. Also working with customers in various fields requires the development of digital skills. At train stations, for example, customers are accompanied in buying tickets on their mobile phones. In branches of the Post- Bank, customers are introduced to how to use online banking tools.

The internet as well as online research and learning is frequently used at Swisscom. In some cases, workplace trainers advise apprentices on the following issues: which online tutorials to learn from, how to access relevant sites and courses and which sites to use for further information. In the department of ICT training at Swisscom, there are, for example, several lists of useful links available through which further information can be easily accessed. Besides that, autonomous research to find solutions and missing information to work with new technologies is a popular way of learning and also expected from apprentices.

> *So, independent does not actually mean that one does everything on ones' own, it just means that one can acquire knowledge on ones' own. In the sense, that I can acquire more knowledge through internet resources, or that I independently approach people. And also, in some cases talk with people that I don't know, and look at the topic with them or just ask them.* (Apprentice, Swisscom)

Many interviewees reported that there is a difference in how easily change is coped with: It differs from generation to generation. Apprentices are considered to be open to use new tools and also bring in their creative ideas on how work processes can be facilitated or how tools could be optimized. Digitalization does not only bring about new tools but also calls for new processes, new ways of thinking

and a different organization of work. As to some extent older employees struggle with changes, at Swisscom, apprentices may function as "ambassadors." They provide tutorials to older employees.

What also became evident in the interviews is that the impulse to consider "digital natives" as competent users or even developers of software is often not matching reality. They are indeed at ease using their mobile phones and navigating through social networks, but this does not mean that they do know, for example, how to use Office components. There are a large variety of competences that someone needs to have to work with computers and while some apprentices start with little prior knowledge and need to learn a lot, others have had experience, but need to build up extended knowledge and expertise.

7.4.3 How Learning and Competence Development Change

Working with digital tools throughout their apprenticeships offers a number of advantages. Among them is a higher flexibility in terms of time and space. Many apprentices, especially in the fields of informatics and mediamatics, in the three firms have flexible working hours; some also have the opportunity to work at different company locations, in co-working spaces, hubs or even from home. This supports their autonomy in the way they organize themselves, requests from them to work independently, structured and self-organized and manage their flexibility wisely to be productive.

> *My boss tells me what he expects from me, what my main tasks are. Then, I have to look for what I need by myself and have to search for more information. We are completely free and can think for ourselves, 'how do we get as fast as possible to the solution that we finally need?' And then, we have the different aids that we can use. Of course, there are the internal tools that help us. One is for example Skype for Business, with which working together and being mobile is made easy. Also, with the laptop that we receive, this enhances our mobility and I have the opportunity to work from home, for example. And, there my boss really says: 'Look, you have this time-span, and you have to work on this project during this time-span. How you do it, I leave it up to you. The result just has to be right.'* (Apprentice, Swisscom)

Flexibility also accounts for individuals' adjustment to constantly changing tools. Apprentices realize throughout their training that their attitude of openness is vital to successfully work in this work environment, because it requires a constant updating of one's skills and competences. Lifelong learning has become a panacea for successfully working with digital tools, which in itself is the precondition for apprentices' adjustment to the new organization of work. Constant software and hardware changes, but also changes in work processes, make apprentices realize how important constant learning and new skills acquisition is.

> *Of course, to be successful, one has to believe in it. One should not go to work and say: 'Yes, another workday, like the others, like the one before'. One has to be always curious. Every day one has to be attentive to news… because Swisscom, for example the sector of mobile*

telecommunication is a huge sector, every day there are new developments… One has to be curious, one has to inform oneself. (Apprentice Swisscom)

The apprentices are aware, that this targeted acquisition of knowledge does not end with graduating from the apprenticeship, but that they have to continue to learn. This attitude is specifically important under todays' premise of lifelong learning. The apprentices develop the perspective, already throughout their apprenticeship, that the acquisition of domain specific knowledge is a continuous process, because the working world constantly changes. (Apprentice Swisscom)

Although, technologies are changing fast and updating oneself is a given precondition for working successfully, the apprentices realize some intergenerational differences. Openness, attitudes towards change, approaches to work and work organization and the usage of new technology often differ between older and younger employees in the company. Some older employees struggle to keep up with technology developments and are supported by apprentices. There are apprentices who prepare tutorials, provide instruction or individually accompany older employees to help them understand new technological tools. Intergenerational learning and teaching can be an aspect of a project at Swisscom.

Older employees, or people that work since a longer time, they look at it from a very different perspective than the young. For the young, technology is extremely important, and how one can do things quickly. The older try to do it so it's really nicely and completely done… they look at things from one step to another. Young people always try to find short ways, so that it works more quickly, so that one can do it in a way that saves time. Older people prefer to make a step more, in the way, they are used to do it from the beginning. (Apprentice login)

I think the older generation profits from the fact, that the young can explain them how today's technologies function. I think they do not have a big problem with that. Maybe they rather have troubles with the fact that what they have known earlier increasingly is pushed in the background. But besides that, I think they are really happy if the young can help them with these things. (Apprentice login)

Digital technologies not only provide the opportunity to work or communicate more efficiently, they also change the ways in which apprentices learn and work. While they are supportive of autonomous work and enable a flexible use of time and space, they also require constant learning and updating of one's skills. Since the young generation tends to be faster in learning in this respect, intergenerational learning lets older employees benefit from it. This trend also contributes to a change in how apprentices are integrated at the workplace and questions traditional ways of viewing the development of expertise.

7.5 Conclusion

Modern learning cultures in apprenticeship training are characterized by an individualization of learning pathways, more autonomous work often supported by digital tools, new team work organizations, new approaches to teaching and learn-

ing and trustful relationships between apprentices and their supervisors, coaches or trainers. Enterprises in Switzerland have made it a commodity to work with a large variety of technological tools to ease learning and work, an asset that helped them to cope successfully with the move to home office during the Corona crisis. Many of the tools are particularly helpful in easing communication within teams, across locations and in different work settings. Apprentices are often quick in learning how to use these tools and do help older employees in understanding and mastering them as well.

When it comes to technology learning, the novice-to-expert paradigm (Dreyfus and Dreyfus 1987) seems to be reversed. Fast technological developments enforce the need for lifelong learning, which apprentices are aware of. For many of them, undertaking an apprenticeship is the first step into working life, but the willingness to engage in further vocational education and training as much as in a variety of options for adult education is high among young people. They know that innovation requires a confident handling of technologies and a disciplined self-organization. The Corona crisis certainly has put a test to that. It strongly indicated that the much conjured digital transformation has taken place for many in VET suddenly and rapidly. Within VET from now on, it will be about manifesting the chosen pathways, further qualifying teachers and trainers and to establish a learning culture that accommodates new approaches to teaching and learning at VET schools and at enterprises. We are at the rise of a major change process that will involve all actors and be an intergenerational learning process (also see Heinen and Kerres 2017).

The new learning culture requires a new understanding of roles in terms of teachers and apprentices, where both can learn from each other and interact in many new forms. Coaching and advising students in their learning process will become more relevant in order to help apprentices to individually navigate their learning process and grow from making mistakes when curiously trying out new things. Digital technologies may support this pathway as much as they support new forms of collaborative team work. While they make travelling time less necessary, they may also support a new balance of life and work.

Based on the findings from the three case studies, it becomes evident that enterprises are encouraging the use of technologies at all levels. VET schools are also responsive to digital trends and need to quickly learn how to work with different tools due to the Corona crisis. Further research is required to investigate the state of teacher preparation for working with new tools, new approaches to teaching and learning as well as to connect the learning between different learning sites. For enterprises, this chapter may provide an up-to-date overview about the tools currently used and how they can be applied within workplace training. Considering that intergenerational learning becomes especially relevant in working with technology, a learning organization should facilitate this in formal ways. More research is needed to fully understand how the majority of enterprise-based learning places respond to digital change and which lessons can be learned from that for VET schools.

Acknowledgements We thank the representatives from Swisscom, Login and Swiss Post for their contributions to this book chapter.

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Chapter 8
Responsible Digital Transformation of Social Welfare Organizations

Birte Schiffhauer and Udo Seelmeyer

8.1 Introduction

In recent years, the debate on digitalization played an increasingly important role in welfare organizations. However, the term digitalization is used to describe a variety of different things (Hess 2019): (1) A narrow use of the term refers to the binary coding of analogue information and thus to make it available for data processing in computer systems, for example, when scanning a paper document. (2) A broader term refers to the processes and procedures that change in the course of using digital technology, for example, in organizations. (3) In a comprehensive sense, digitalization describes a social and societal transformation process described in terms such as the "network society," the "knowledge society," the "information society," the "control and surveillance society," the "digital capitalism" or the "culture of digitality." In the following, we take the second definition of digitalization as a basis. We do not understand digitalization in a narrow technical sense, but rather focus on aspects of social and organizational embedding and contextualization of socio-technical systems.

Digitalization is already an integral element of social welfare organizations: Information systems support professionals during anamneses, planning, accounting, administration and documentation (Gillingham et al. 2020; Ley 2012). Digital technology supports communication in the social sector, communication between professionals, but also between professionals and clients (Döring 2019; Seelmeyer 2018). Some organizations use online counselling, and even the usage of chatbots to support social services is debated (Waag et al. 2020). Another technology strongly

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_8

discussed is the application of decision support systems (Bastian 2017; Schneider and Seelmeyer 2019; Gillingham et al. 2020). Those systems are algorithm-based and make use of big data analysis. In addition, assistive technologies support social services (Klein 2010; Schiffhauer 2020). Using those sorts of technology can have great impact on organizations, professionals and clients (Kutscher et al. 2014) as well as on society.

Digitalization should be handled and reflected by social welfare organizations in respect of four dimensions: risk, chance, responsibility and necessity (Schiffhauer 2019): Digitalization poses multiple social and ethical challenges (like substitution of employees or surveillance), which must be observed and evaluated in terms of the goals of social organizations. Chances of digitalization present themselves in opening up opportunities for the employees and addressing social services (e.g. supportive innovative technology). Social organizations need to take the responsibility of actively monitoring and constructing the effects of digitalization for the benefit of the people and to enhance social compensation, as counteracting discrimination is one of the major tasks for social welfare (BAGFW 2017). Finally, digitalization is a necessity as it is essential to reduce costs or improve services and disruption of traditional social services can already be identified (e.g. offering different kinds of social services through a single platform, Faiß 2018). These four dimensions elucidate the importance for a responsible digital transformation of social welfare organizations understood as a continuous organizational process of change. Thereby, the integration of innovative technologies has to be considered, which transform products, services, business processes and business models.

However, there is no blueprint on how social welfare organizations could go through this digital transformation process. Common innovation and organizational development processes cannot be applied easily as social welfare organizations differ from industrial companies (Eurich et al. 2018, p.3; Parpan-Blaser 2018, p.262). Accordingly, there are hardly any models for social services to initiate, design and implement social innovation processes (Parpan-Blaser 2018, p.262; Schöttler 2018, p.157, Eurich et al. 2018, p.1). Furthermore, there is a lack of systematic concepts for the evaluation of technologies for usage in welfare organizations (Buhr et al. 2016) and for social services (Becka et al. 2017). In this respect, it is necessary to adapt procedures from the context of technology development to the requirements and general conditions of social welfare organizations and at the same time to develop suitable models for introducing and anchoring digital technology as a social innovation in the organizations. How this challenge can be encountered will be illustrated by means of a case study that describes a corresponding procedure at the German social welfare organization Arbeiter-Samariter-Bund; Workers' Samaritan Federation North Rhine-Westphalia registered association (ASB NRW e.V.) Without recapitulating the scientific discourses on organizational change processes, at least a well-founded classification of the case study outlined below should be made. The procedure developed there is based on reflexive approaches of technology development, characterized by a strong emphasis on user-centricity and the inclusion of ethical aspects. These approaches are not limited to the aspect of technology development but are extended by elements of organizational development as well as criti-

cal success factors of change processes. As a basis for this, fundamental aspects for a successful organizational development in social welfare organizations will be worked out in the following in order to link this in a next step with existing frameworks and methods from the context of technology development such as Responsible Research and Innovation (RRI), Design Thinking and Human-Centred Design (HCD) for interactive systems.

8.2 Organizational Development and Innovation in the Context of Social Services

Discussions about and management of transformations in welfare organizations should involve organizational-theoretical considerations. Different disciplinary approaches – from sociology and psychology to business administration and management – differ both in their focus on content and in whether they primarily provide analytical or practical knowledge. Classical organizational models in the tradition of Max Weber assume that organizations are essentially structured by rationality of purpose. However, recent approaches in organizational sociology point out that such rationalities of purpose have a legitimizing rather than an instrumental function in the control of the organization (Grunwald 2018). This leads to a shift towards informal logics and practices in organizations, which can complement, irritate and overlap formal processes and structures (Büchner 2020). These findings can be used as analytical starting points for the processes of organizational learning and organizational development in the context of digital transformation. Out of the broad spectrum of organization-related theories, analyses and concepts, those dealing with organizational change processes are of particular relevance to the following considerations (cf. as an overview, e.g., Schreyögg and Geiger 2016, 357 ff.). There are many findings on barriers to organizational change, as well as on the prerequisites, principles, phase models and methods for successful change. Approaches such as organizational development (Cummings and Worley 2015) – in the diagnostic and dialogical variant – organizational transformation, organizational design, change management (Doppler and Lauterburg 2019) or organizational learning (Huber 1991) can be roughly distinguished and described with their respective focuses and emphases. However, usually, they are not clearly defined and show some overlaps. These more basic approaches are complemented by more limited and focused concepts such as quality development, quality management, knowledge management or – currently popular – innovation management.

Core elements of almost all models of organizational development and at the same time critical success factors of change processes are employee participation and transparency of communication about the process (Frey et al. 2008). Frey and colleagues point out that change processes can lead to uncertainty among employees. They suggest that employees should participate at the change process, so that they can (re)gain control over the situation. This could lead to a stronger identifica-

tion of the employees with the project and further on motivate and encourage their involvement. In addition, there should be a clear goal and vision set up and communicated in a transparent way to everyone involved. A common mutual awareness is seen as a basic principle for a successful change management process. A close connection between technology and organization is also central to concepts such as innovation management (cf. Hauschildt et al. 2016). However, the methods developed there, which are usually designed for the corporate context, cannot be easily transferred to the field of social work and welfare organizations.

There are three types of organization that predominate in the field of social work in Germany: (1) state agencies and administrations, which can act both as funding partner and provider of services, (2) welfare organizations and (3) social economy enterprises, whereby in practice, different hybrid forms of the latter ideal types occur. The organization Arbeiter-Samariter-Bund referred to in the case study can be assigned to organization type "welfare association," but also has elements of the type "social economy enterprise." Social welfare organizations can be determined as "professional organizations" (Klatetzki 2012), which combine bureaucratic structures within team structures based on professional values (Klatetzki 2012, 175 f.). Besides bureaucratic and profession-related rationalities, Schöttler refers to economic, socio-political and association-specific religious or ideological objectives and logics as supplemental rationalities (Schöttler 2019, p. 90). In order to connect these multiple rationalities productively, additional communicative spaces are needed. Those enhance the "discourse capacity" of the organization and lead not only to technical but also systemic innovations (Schöttler 2017, 2019). The characteristic of social welfare organizations as pluralistic or hybrid organizations is important for the design of innovation and transformation processes: In contrast to routine and projects, innovations are characterized by the fact that neither path nor goal is clear and must be developed first. Therefore, the mindset for goal development associated with the term "open innovation" (Chesbrough 2003) is evident in the entrepreneurial context (Schöttler 2019). Nevertheless, innovations are always risky as well as the resources used for them. Hence, Schöttler proposes a "state-gate process" (Cooper 1990) as a multi-stage decision-making process with increasing resource input.

As social work can be defined as "a practice-based profession and an academic discipline that promotes social change and development, social cohesion, and the empowerment and liberation of people" (IFSW 2014), social welfare organizations base their work on specific norms and values. The importance of specific norms and values lies in the interaction with often vulnerable or marginalized groups and/or individuals. The goal is to help, to empower them and to increase their well-being (Homfeldt 2012, p. 499). Therefore, it can be stated that working with those people implies moral and legal components (Klatetzki 2010, p. 10). Social services in particular have a moral component, since clients are often affected by social problems, which are anchored in the social structure of a society. These can change depending on the current norms and values of a society, so social services also require analytical reflection (Kessl and Otto 2012, p. 1310ff.) For example, in their work, profes-

sional social workers refer to a code of ethics that includes human rights and social justice (DBSH 2016, p. 2; Staub-Bernasconi 2009, p.133ff).

Thus, social welfare organizations have to focus on the social and ethical aspects of digital transformation and innovation processes. Innovations in this field are always to be conceived as social innovations in the sense that they are "innovative activities and services that are motivated by the goal of meeting a social need and that are predominantly diffused through organizations whose primary purposes are social" (Mulgan 2006, p.146). Although systematic concepts for a responsible and reasonable ethical and digital transformation for social welfare organizations are missing "Responsible Research and Innovation" (RRI), Design Thinking and Human Centred Design (HCD) for interactive systems offer frameworks for responsible innovations and therefore are discussed in the following chapter. RRI is a rather open framework for an ethically oriented design of research and development processes and has its roots in the context of European research policy and funding. Design Thinking is a methodological approach that aims at the development of user-oriented, innovative problem solutions by combining different creativity techniques and a high degree of interdisciplinary cooperation. HCD in turn represents a process model especially for development of interactive technical systems, which also includes standards for this. The three approaches thus have a different focus on the levels (1) framework/orientation, (2) process/method and (3) content standards.

8.3 Frameworks for Responsible Development and Implementation of Digital Technologies

The core problem of responsible innovations and digital transformation is that the effects must be anticipated in advance, but the consequences cannot be predicted with certainty until the innovation is developed and used. At the same time, it is difficult to alter the innovation, when it is widely distributed, so-called path dependence (Collingridge 1980). Using the framework of RRI is one way to anticipate the impacts before and during the innovation process. Although there is no widely accepted definition of RRI (Bogner et al. 2015; Lindner et al. 2016), the idea is that "Responsible innovation is a collective commitment of care for the future through responsiveness, stewardship of science and innovation in the present" (Owen et al. 2013, p.36). RRI is an iterative and multi-actor-integrating approach to direct and control research and innovation in a normative way, for example, based on sustainability or social desirability (Lindner et al. 2016, p.10). Thus, the integration of such a process is suitable for social welfare organizations, as they aim "to motivate people to work for the common good and […] to follow the idea of social justice as advocates for people in need of help" (https://www.bagfw.de/ueber-uns/freie-wohlfahrtspflege-deutschland/selbstverstaendnis). For the implementation of the RRI framework, four dimensions are proposed (Owen et al. 2013; Lindner et al. 2016): reflexivity, deliberation, responsiveness and anticipation. Being reflective means

rethinking one's own activities, goals and motivations and assign to codes of conducts and regularities (Owen et al. 2013; Stilgoe et al. 2013). Deliberation includes an inclusive approach, transparency of the project in the organization as well as in the public, open discussions and debates with stakeholders. Responsiveness refers to a collective and "open process of adaptive learning" (Owen et al. 2013, p. 38) in order to adapt the innovation process iteratively. The dimension anticipation encompasses the description and the analysis of potential (un-)intended impacts, including methods like technology assessment (Owen et al. 2013).

Design Thinking is an approach that can be used for developing and implementing innovations of teams and organizations especially for "wicked" problems (Beckman and Barry 2007). The innovation approach Design Thinking can be applied to any area and any organization in order to increase innovative magnitude; it focuses on the user's point of view and an interdisciplinary co-development with iterative circles to improve the outcome of the project (Carlgren et al. 2016). This approach is therefore also suitable for identifying innovation potential in social welfare organizations. Human-Centred Design for interactive systems (HCD) according to ISO 9241-210 provides a framework for orientation. HCD is a tool for the development of hardware and software to enhance human-machine interaction focusing on human factors. It proposes that the activities for designing human-centred (digital) products are divided into different phases: Impulse & Planning, Specify Context of Use, User Requirements, Design Solution and Evaluation and Testing (DIN EN ISO 9241-210). These two processes can be combined well with each other.

Although Design Thinking and HCD focus on human factors, the ethical evaluation and the focus on responsible innovation is not given enough attention. As it was stated before, ethics and responsibility should be the focus of innovation management in social welfare organization. Thus, Design Thinking and HCD could be combined with methods like RRI for a responsible development and integration of innovations in social welfare states. Therefore, even if there are no specific models of innovation processes for social services, innovative methods such as Design Thinking (Hartmann 2018, p. 144) and HCD together with RRI can be a useful starting point for social service organizations. Based on a project of technology development and implementation, a case study at the "Arbeiter-Samariter-Bund" (ASB) combined these approaches in order to guide the welfare organization through the process of digital transformation.

8.4 Practical Experiences: A Case Study

The social welfare organization Arbeiter-Samariter-Bund (Workers' Samaritan Federation) is a non-profit organization offering services to people's needs like care for the elderly, rescue services, first aid, assistance for children and support for people with disabilities, as well as support for refugees. The organization has more than 1.2 million members and is divided into 16 regional organizations. One of them

is the ASB NRW e.V., where the conducted case study took place. Due to its special responsibility for vulnerable people, the ASB NRW e.V. aimed to innovate and integrate digital technology responsibly. As systematic concepts about the assessment of technology usage and how to integrate technology in social welfare organizations were missing, different concepts like RRI, Design Thinking and HCD were adapted and used to develop a concept for the digital transformation of the ASB NRW e.V. Thereby, important insights of change management processes were included like participation of the team and transparency about the process (Frey et al. 2008). Of course, it has to be mentioned that digital transformation is a process and never is completed. In addition, processes in reality are never conducted as an ideal type.

Participation and transparency are important elements of successful change management processes (Frey et al. 2008; Werther and Jacobs 2014). Therefore, in 2019, the digitalization strategy for ASB NRW e.V. was developed on a participatory, human-centred and scientific basis. First a literature research and a qualitative organizational diagnosis were conducted. The qualitative organizational diagnosis was based on the results of a previous organization development process: all relevant documents were analysed regarding to their importance for digitalization. This was done to ensure that all association-specific religious or ideological objectives and logics were taken into account as suggested by Schöttler (2019, p. 90). Thereof a preliminary digitalization process was conducted.

In accordance with the RRI dimensions "reflexivity" and "deliberation," five workshops were realized. Participants were all associated to the ASB NRW e.V., including volunteers, employees and managers. In all workshops, the preliminary digitalization process and – relating to the RRI dimension "reflexivity" – the goals, motivations and possible consequences were discussed. After each workshop, the digitalization process was adapted following the RRI dimension "responsiveness" and the idea of iteration of the HCD and Design Thinking (for detailed procedure: Schiffhauer 2019). These workshops also opened up additional communicative rooms, as it is needed in social welfare organizations for the development of a discourse (Schöttler 2017/2019). Because of these discussions, the following goal for the ASB NRW e.V. was defined as a *guideline for the digitalization process*: "On the one hand, the ASB aims to further develop its services and establish innovative service areas through digitalization and further technical and medical progress. On the other hand, it is also the aim to maintain and further develop values such as humanity, solidarity and respect as the supporting pillars of our society – in the face of accelerating technological development" (Schiffhauer 2019).

Based on this guideline, two medium-term strategies were developed to achieve the stated goal. The *first medium-term strategy* is "Including the own expertise in the debate on digitalization in society as a whole." It contains the constant and active participation of the ASB NRW e.V. in meetings, workshops and conferences on the topic of digitalization and society to contribute to the guideline. This strategy also includes creating transparency about the digitalization process within the ASB NRW e.V. Therefore, the digitalization process was presented at academic conferences as well as at workshops for professionals and peers. Beneath transparency,

this also enhanced collaboration and communication between academics and society, congruent with the RRI approach (Lindner et al. 2016). Transparency was also created via the website "asb-digitalisierung.de," where information was provided about the process, all talks and participations at conferences, discussions and activities in society.

The *second medium-term strategy* was the deployment and implementation of a process for the "human-centered development of the social services of the ASB NRW e.V. through digitalization" (see Schiffhauer 2019). The HCD approach (DIN EN ISO 9241-210:2010–01) was used as a basis for the process, and methods of Design Thinking, RRI and ethical evaluation of socio-technical arrangements (Manzeschke et al. 2013) were integrated. The testing and application of this strategy are described in the following.

First Phase: Impulse and Planning Impulses are often an important prerequisite for innovations (Guldin 2004). After a visit to the virtual reality (VR) time travel through the historical Cologne, the idea emerged to use the immersive experience of VR in the first aid training. This approach fulfilled the function of opening up employees to the later process of integrating such technologies and arousing their interest, as described early on by Lewin (1947) as the first phase of Unfreezing for change processes. Afterwards, the planning of the project began. For this purpose, an interdisciplinary project group was formed.

Second Phase: Specify Context of Use In the second phase, the context of use was determined (DIN EN ISO 9241-210). A scientific research and a market analysis took place to generate an overview of the current state of research in the field of "VR in first aid training." To specify the context of use, it was agreed to develop a "Virtual Reality Learning Environment" (VRLE) as a 360° movie, which is supposed to support the learning of first aid and can be used in the context of first aid training.

Third Phase: User Requirements The third phase focuses on determining the user requirements of the product. For this purpose, a workshop involving all stakeholders (e.g. experts in first aid training) was conducted, following the recommendations of the HCD approach and the dimension deliberation of RRI. The previously considered context of use was put up for discussion (RRI-dimension: responsiveness) and expanded by the group of experts. The selection of the training units to be implemented in VR was carried out in a participatory manner with Design Thinking methods such as brainwriting, clustering and brainstorming. In order to extract the usage requirements for the VR application, the most important points were collected and written on maps in a brainstorming session. These points were then discussed and clustered in categories "benefit" and "concerns" in the plenum using a metaplan technique and a further category "challenge" was added. In particular, this discussion was accompanied by a lively debate on the goals, motives and consequences (RRI dimension: reflexivity). In addition, an ethical evaluation scheme was developed and sent to the working groups to extract possible negative and positive

effects of the VR application and thus to integrate the RRI dimension "reflexivity" and "anticipation." The evaluation scheme was developed from an adaption of the MEESTAR model (Manzeschke et al. 2013) with reference to the "Challenges of social work through digitalization" (Kutscher et al. 2014). In a joint web conference, the further development of the scenarios including the ethical evaluation scheme was discussed.

Fourth Phase: Design Solution In the fourth phase, the prototype was developed. Working groups (including experts and other stakeholders) wrote the storyboard for the 360° film. The film was shoot in a Kindergarten and the application was programmed.

Fifth Phase: Evaluation and Testing In the fifth phase, the prototype was tested and evaluated. A first usability and user experience (UX) evaluation with the method thinking aloud (Nielsen 1994) was realized with ASB members as participants. Thinking aloud is a method often used in Design Thinking processes and for the evaluation of usability and UX, where the user is thinking aloud when working on the tasks. It has the advantage that possible obstacles or annoyances of the prototype can be identified directly (Nielsen 1994). The aim was to identify the most serious usability problems and first UX aspects in order to report them to the company quickly. In addition, the participants were also asked to fill out the ethical evaluation. Based on the results of the first UX study, the application was adjusted (RRI dimension: responsiveness).

Throughout the whole process, the success factors of change management were kept in mind (Frey et al. 2008). In order to ensure transparency, for example, a high-quality designed mailing was sent to all ASB state associations and to the ASB federal association. The mailing contained a cover letter informing about the digitalization process at the ASB NRW e.V. and inviting further discussions on the opportunities and challenges and encouraging questions, ideas and suggestions.

8.5 Conclusion

This description of the practical example aimed to give an insight into ideas of how social welfare organizations are dealing with digital transformation processes. Just as the visit to the virtual reality time travel through the historical Cologne initiated the unfreezing phase for the VR Project, the VR Project can be understood overall as an unfreezing phase for a broader organizational development process. It has to be evaluated in the future how the developed strategy and the VR Project works into the organization and could transform the organization socially and ethically. Although this is just a beginning, the described strategy and the project enhanced the communication about digitalization. Often it is not clear what people are referring to when speaking of digitalization. The workshops created a common under-

standing about what digitalization is and even more important which goals and values the ASB NRW e.V. is aiming to proceed in a digitalized future. Digitalization was no longer a fuzzy cross-section topic but a tangible project one can refer to as an example for digitalization. At the ASB NRW e.V., the communication about digitalization was enhanced due to the specific reference to the VR Project – like the naming of extreme weather phenomena improves the communication about them among the population (National Weather Service 2014).

The project also served as a lighthouse project to provide a model on how digitalization projects or the development and implementation of innovative technology can be carried out. Because of its high relevance, great importance was given to planning and reflecting the process in detail, involving and motivating people to participate and training the team in evaluation of ethical aspects of innovative projects. This was very time consuming and sometimes, it was difficult to motivate people to participate in a further evaluation as this project was in addition to their regular work. It is questionable whether it is possible for an organization to provide the time resources. Further projects should be able to be implemented more quickly as existing knowledge about the process is already available. Nevertheless, it seems feasible to reduce the workload of the experts. Although participation is needed and appreciated, it was realized that working on the storyboards for the 360° film in the working groups was too much work for the experts in addition to their time-consuming main work. A task force could prepare, for example, the storyboards and then ask the experts for feedback. Participation of experts has to be weighed carefully against the time and financial resources available.

However, this process fulfilled the goal of organization development to be a process of "facilitating change and development in people (e.g. styles, values, skills), in technology (e.g. greater simplicity, complexity), and in organizational processes and structures (e.g. relationships, roles)" (Friedlander and Brown 1974, p. 314). The expertise of the experts in first aid training and broad-based rescue service training was needed in the development of innovative technology, which could be used to improve their teaching. This integration of employees is also a strategy to improve the motivation of participation and to reduce anxieties towards digitalization (Frey et al. 2008). As suggested by Frey and colleagues, this was a way that employees could gain control over the situation. However, uncertainty is immanent in the process of digitalization and its effects cannot be anticipated in advance overall (Collingridge 1980). Nevertheless, this process helped to recognize the expertise of the experts. In addition, it was important that all experts agreed on a mutual procedure of development and integration of the technology. Since the implementation of the VR application in first aid training will be on voluntary basis, the commitment of the experts is important for the success of the project.

With the described project, the essential guidelines that Schöttler (2019, 94f.) developed for innovation processes in welfare organizations could be addressed: (1) By means of the exemplary examination of the possibilities that VR technologies offer for a classic service process such as first aid training, the project was able to establish an overall openness and language ability with regard to aspects of digital transformation in one's own association. (2) Due to the broad composition of the

groups of people involved in the workshops, new communication spaces were created, which promoted the ability to discourse even across different disciplines, professions and company divisions. (3) Through an appropriate design of the development process, these different environments and rationalities could be included at an early stage. (4) The intended fundamental examination of the organization with the chances, risks and challenges of digital transformation was concretized in the form of a practice-relevant project. However, this presupposed that the necessary free space and resources could also be made available for this. It was shown that it is useful for social welfare organization to use, adapt and combine the different methods RRI, Design Thinking and HCD to go through the digital transformation. But they need to be reflected on the needs of the organization and the process has to be adapted after each project, as digital transformation processes are learning processes. Future research should address the needs of social welfare organizations in digital transformation processes in specific regarding the time issue, as negotiation processes and iteratively discussions are very time consuming.

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Chapter 9
Leading Transformation with Digital Innovations in Schools and Universities: Beyond Adoption

Eugene Kowch

9.1 Introduction

> Innovation doesn't happen in a vacuum but requires openness and interactions between systems and their environments. This is also very much the case for education. (OECD 2016, p. 3)

Digital technologies do not transform a learning organization in isolation, but they can offer high potentials for constant-flux schools and university contexts. In this chapter, we argue that leading digital transformation in the learning organization first requires different *leadership* approaches and then different *organization* structures to allow more *autonomous, team-based digital innovation efforts* across education *ecosystems* (Kowch 2018a). Only then can schools and universities adapt to digital innovation experiments that can truly transform their products and processes (learners with better lives). First, we explore how existing formal leadership ideas to "adopt" education technologies have been confused with true innovation to offer leaders and innovators a different path for conceptualizing great digital innovation as a complex mix of experimental, evidence-informed, risk-taking done by networks of teams. Daimler-Benz cannot transform the company by inventing a driverless car. Yet in their past they have transformed the company by changing the processes and products of the organization by integrating ideals for safe driving with vast technological innovations. Innovation in education systems means much more than invention, technology or technology adoption alone.

Contemporary Education change scholars warn that schools and universities cannot lead such transformation because we fail to create adaptable organizations that can transform with our digital innovations (Hargreaves and Shirley 2012). Instead, we focus on piecemeal, microscale change in learning while making huge technology investments in organizations (Fullan and Kirtman 2016), while the

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_9

OECD (2016) warns that massive global education technology investments have failed to generate proportional learning improvements for learners.

The ***problem*** is that educators need knowledge to *organize* and to *lead* digital innovation teams differently today. Ifenthaler and Egloffstein (2020) remind that digital technology integration is an important mission for every business, organization, or institution not only for communication, administration, and management but also for learning and instruction/teaching (p. 302). However, with artificial intelligence, Big Data, smart classrooms (Ifenthaler 2017), and service robots (Kowch 2020) arriving in the near horizon to help teaching and learning, digital innovation teams need guides for leading a more integrated approach to leading, learning innovation work that offers a better chance to transform the learning organizations.

Our understanding of education ecosystems has changed a lot from historical presumptions of stable, linear role-in-function systems (only dead systems are stable) to unstable systems with complex, interconnected dynamics where a change in one part of the system affects all other parts of it (Schwandt and Sabla 2007; Hazy and Uhl-Bien 2015). Too often misunderstood by university leaders as "apps" for achieving vaguely defined "transformation" adoption and buy-in, most educational technology projects live short, hectic lives. Here we offer theory and practical guidelines for digital innovation leaders who guide integrated solutions that can, with the right leadership and organization, truly transform and sustain a school or university.

Section 9.2 explores why classic, more formal approaches to leading and organizing our work constrains the adaptive spaces necessary for digital innovators and leaders interested in real transformation. Section 9.3 outlines how (less formal) leader and organization approaches can lead and organize work differently as ecologies of innovation thriving in more open organizations. We demonstrate how and why digital innovation teams have a better chance to impact deep school and university change by forming highly capable relational teams within more adaptive organization structures or "homes" for that important work. The final section offers theory and practical guidelines for networked digital innovation team members and leaders whose experiments can be better engines for genuine, system-wide education organization transformation.

9.2 Formal Leaders in Formal Organizations: Limiting Space for Innovation

Classical formal leader epistemologies fit tongue-in-groove with formal organization epistemologies (Clegg et al. 2011). For digital innovators (all innovators) today, that classic way of knowing technology, education systems and leadership is a toxic combination that unconsciously limits individual and team innovator potential for school or university transformation. In this section, we explore four important concepts and features for leading and managing digitization and change in education systems today: *people*, *power*, *systems*, and *change/innovation* (Hallinger and Heck

2002). Senge et al. (2000) remind us that informal leaders *do the right thing*, while formal leaders *do things right* (as process managers).

9.2.1 *Formal Leadership:* Doing Things Right with People, Power, Systems, and Change

For over a century, scholars and practitioners in education have struggled to define educational leadership but many agree with Yukl's (1994) meaning:

> Most definitions of leadership reflect the assumption that it involves a social **influence** process by one person (or group) to **structure** the activities and relationships or in a group or organization. (p. 3)

Formal leaders operate within the confines of roles and vertical power lines forming limited paths for transactions usually aimed at improving work flow efficiencies. Formal leaders consider the *utility* of a technology in terms of how it will improve functional efficiency from subordinates working together, but from different specialist 'silos'. In the last century (1900 to 1950), Taylor's scientific *management* theory defined *formal leadership* first as a set of predictable cause-effect, rule-based work relations between managers supervising employees in steady-state systems (organizations or institutions) in terms that do not describe the hyper-connected leading and working world of education organizations, yet you can find many scientific managers in at any moment or context in education today. Scientific leaders think about the inputs, processes, and outcomes of work done by ***specialized-labor*** employees with an overall goal to apply psychology for improved organization (school, university) outputs—so social dynamics and worker humanity did not concern early formal leaders aiming for stability. Because change and innovation in a system introduces risk, formal leaders minimize experimentation, risk-taking, and innovation. Per the leadership of Henry Ford, innovation occurs "at the top" of traditional, formal closed systems (Enkel, Bogers & Chesbrough 2020). Not all leaders are Bill Gates.

Formal leaders understand ***power*** as a commodity that is attributed to a position (rank) and aligned within a vertical *power-over* hierarchy designed to control scarce resources (Carlsen et al. 2020). Formal leader power is not earned, rather it is assigned by comparing the rank of a leader over managers and employees functioning within strict rules assigned by their specialization and functions in an institution (Hallinger and Heck 2002) so position in the organization pecking order matters as much as capability. Carlsen et al. (2020) charts and laments how entrenched leader ideas about positional power-over reduces creativity and isolates individuals from collectives while scientific leaders have also been critiqued for ***power-over*** tactics for their "obsession with tight, top down control leading to institutional dysfunction" (Maguire et al. 2006, p. 173). This researcher has found repeatedly that formal leaders are more common in schools and universities struggling not to function as industries.

Formal leaders also understand their institution's existence as a factory unto itself—consciously or not, formal leaders act within what they believe is a ***closed***

system with inputs, processes, and outputs bounded by the institutional rules, roles and operating policies associated with it (Schwandt and Szabla 2007). *"Closed systems are considered to be isolated from their environment" as steady-state systems* (Bertalanffy 1968, p. 38). When a university provost evaluates the efficiency of an online learning program and faculty using LMS (learning management software) data (discussion frequencies, grades, logged time online) alone, he or she is leading formally to improve core processes isolated within the organization. As a *manager*, he or she is "doing things right" by ***adopting*** a proven efficiency tool or mindset (Senge et al. 2000), not really considering the complexity of interconnected subsystems such as learner preferences, adult life contexts or even cultural learning histories that might have powerful effects on the success of such technological enhancements. This is a real problem for digital innovation teams in schools, where, for example, we know that good online learning technology *could* transform a failing face-to-face school into a thriving cyber charter school (Kowch 2009). But formal leaders care less about the complexity of social systems, working on good transaction efficiency in a closed system model without regard for technical, pedagogical, or even financial potentials offered by digital innovations, for example. Formal leadership reduces the project to linear, stable and closed work organizations that may never have existed, and that certainly do not exist in today's education reality.

Leading change is an important element in education leadership thinking and praxis, particularly when innovations are involved because innovation *causes* change, to an extent, in education organizations (Fullan 2015). Digital technologies are often the greatest sources of such change in our time. Still, formal education leaders approach changes from an ***industrial paradigm*** stance where a change to inputs, usually in terms of human or mechanical performance, is believed to result in predictable linear cause-effect desired outcomes (ideally) so most leaders today apply systems theory to ***adopt*** a technology by following predictable ***innovation S-Curves*** in the back of their mind (Fig. 9.1), aiming for a specific change. Because adoption can be forced or manipulated in vertical power orgnizations, formal leaders often lead change by (a) seeking "buy-in" among employees for a technologically enhanced process that will result in what they hope will be an organizational change (Rogers 1962) and by (b) hoping that a technology or "app" can and will change the organization (Visvizi et al. 2018). This *linear cause-effect* approach to change leadership and innovation has been harshly criticized by contemporary organization and education scholars, who have proven time and again that formal leaders mostly create "piecemeal" or incremental change in education systems by assuming linear, steady-state change parameters while ignoring human learning and socio-technological influences (Reigeluth and Duffy 2008). The result is often a change that does not sustain, or a technology that soon sits idle after considerable investment.

Today most education systemic change research involves linear thinking about organizations assumed in steady states (equilibrium), a false assumption that hinders necessary experimentation and knowledge exchanges needed to change a school (Cabrera and Cabrera 2019; Kowch 2019; Reigeluth and Duffy 2008). In fact, many of the authors in Springer's *Systems Thinking and Change* major refer-

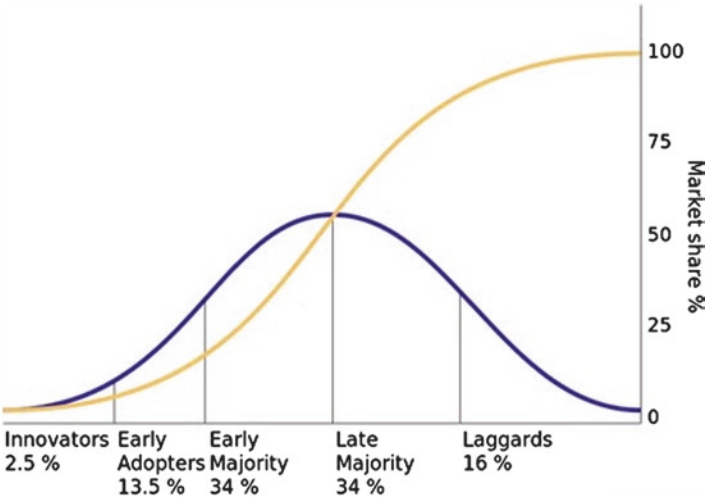

Fig. 9.1 Innovation Diffusion Curve (Rogers 1962). (Source: https://commons.wikimedia.org/wiki/File:Diffusionofideas.PNG)

ence volume (Kowch 2020) write that when *education* technology is present, formal leadership falls short because formal leaders strive to maintain the status quo so as to avoid uncertainty brought by experimentation. That limits both risk-taking experiments and the adoption of innovations (Uhl-Bein et al. 2007), often reducing digitization to a matter of acquiring expertise that is directed to perform isolated (closed system) transactions without deep consideration of social factors in or beyond a school or education setting. By ***leading change as individuals*** (with variable practices), formal leaders depend on line management and role specialists believing that the purpose of the university or school is a pipeline for delivering individuals to society in systematic ways, so they wind up with limited success when engaging professions and the larger institutional community so essential to the sustained success of the change (Hargreaves and Shirley 2012).

9.2.2 *Formal Organization:* Restricting Adaptive Space for Innovation

An ***organization*** is a mental model for a structure that "houses" people doing work together in a "space" where a body of individuals *work* under a defined system of *rules*, *assignments*, procedures, and *relationships* designed to achieve identifiable objectives and goals (processes, products) (Greenwald 2008, p. 6). Formal organizations are highly structured, closed bureaucratic system arrangements of specialized people with vertical power responsibilities framed by clear rules/policy within isolated institutions most often acting with formal leaders adopt a closed system (Clegg

et al. 2011, p. 148). ***People or laborers*** in a formal organization are assigned by *position and function* in a vertical hierarchy of functions (as in an organization chart), so their relations are prescribed by reporting lines (up and down). Working across departments, units, and specializations is challenging, if not impossible. For example, professor might have a good idea for a technological innovation to enhance instruction, for example, but because getting the technology information from the Information Technology department on the necessary instructional elements is not part of the IT person's "job" function per se, the instructional innovation stagnates. Post-COVID mandated instructors in universities, for example might find that an integrated student/instructor meeting booking system might just improve both learning and instruction, but in formal organizations with IT departments essentially operating out-of-house LMS packages, such an innovation cannot be specified technically or operationally because teaching is not connected to the design of the learning management system in-house. This formal organization or house is not designed for sharing information and ideas across lines of functional expertise.

The biggest challenge for next-generation or 21st century organizations in education is that are rather formal ***bureaucracies***—an industrial age concept critiqued for separating persons from their office in organizations characterized by ***hierarchical power*** and chains of command, *meritocracy*, and *rule-based* decision-making (Marion and Uhl-Bien 2001, 2007). These houses are not designed for the knowledge age, nor are their formal leaders. Bureaucracies like this exist mostly in *formal* organizations where leaders at the top of the organization structure possess ***power*** "over" people in positions below them and so on (Gu et al. 2018) along a "chain of command" enshrined in the organization structure that is the same if it is "bottom up" or "top down," limiting lateral influence beyond job functions.

So we argue that formal education organizations are ***closed systems that are always restricting heterogeneity or diversity*** that is essential for today's innovating organizations. Bureaucracies function to maintain formal organization structures, thus limiting engagement across schools, favoring top-down state investment and dependence on separate experts (i.e., Information Communiction Technology (ICT) experts, educational technologists, policy makers, financiers, disciplinarians in STEM) in the *most brittle, change-resistant and unsustainable structures* (Hargreaves and Shirley 2012). A common formal organization response to a lack of capability is to create mini-hierarchies or sub-structures (committees) of assigned experts resulting in organization charts that grow vertically—like Topsy. We need new mindsets to re-imagine collaborative, shared expertise and experimentation (often with digital processes) in more flexible organization forms (less formal) essential in the knowledge era.

Leading change in formal organizations means work by formal leaders in bureaucracies shaping cause-effect efforts without consideration of the constant-flux environments outside education organizations. So education change leadership amounts, most often to micro level incremental, linear change efforts focused on a manageable part of the organization and not on the whole school, making transformation of that school (digitized or other) *piecemeal and difficult to sustain* (Reigeluth and Duffy 2008).

Formal organizations are a "house" for digital innovation destined to occur by their very natures across a labyrinth of functions that bind expertise and restrict the space of the possible from often unconscious boundaries around people and by impeding risk-taking, experimentation and innovation, especially in education (Hargreaves and Shirley 2012).

For example, a recent case study (Downing 2018) of educational technology decision-making found a closed-system, power-over mandate from a government official to use (adopt) thousands of iPads in national following the top minister's consultation with expert vendors only. Adoption by most professors using the "super app" iPad innovation did not improve instruction, learning, or leadership. This study found that students only had slightly better access to the Internet. The product (learning) and adoption (instruction with iPads) did not change or transform the universities because their utility was only visible as in-house tools with limited connection to the lives and learning found among networks of instructors and students who were simultaneously and differently well-connected to the rest of the world. A new tool in a closed system that is not understood in terms of instruction and learning cultures is not an innovation, it is an adoption.

9.3 Informal Leaders in Less Formal Organizations: Creating Adaptive Spaces

> The rapid and continuing development of technology in schools requires a new generation of leaders who to use these new tools to enhance their own productivity and decision-making activities and who understand the benefits of integrating technology into learning. (OECD 2016, p. 146)

9.3.1 Informal Leadership: Doing the Right Things with People, Power, Systems, and Change

From 1950 to 1970, education leadership theorists realized that the work of educators and learners is not trait-dependent but rather that it is a more interdependent body of activity that is better conceptualized as a blend of *social* systems and human *psychology*. This was the dawn of the *linear* ***information processing*** (IP) or *learning systems* epoch when education administration scholars recognized that leadership by top-down actors in vertical power hierarchies depended a lot on specialized labor but also it depended on highly trained people who learn and live outside and inside the organization (Lord and Brown 2001). IP type leaders set goals and interventions to achieve prescribed learning and teaching outcomes as transactions in machine-like processes where **people** are considered ***human resource*** **assets.** Organizations (schools and universities) welcomed the integration of social dynamics elements to leadership thinking but individual hearts and hopes seemed left out

of leader discourse and praxis. During this time, early educational technologists created teaching machines and explored mediated technology-enhanced learning hardware and software as well as instructional conditions.

By 1970, falling short of theory that predicted actual education leadership practice and reality, leadership theorists expanded their homogeneous integration of *social systems*, or team concepts so that leaders could consider values and ethics models as part of their work (Greenfield 1984), deepening leadership thinking and directing more action toward duties of care. By 1990, leadership scholars added individual ethos, ethics, and social values in less linear educating process models informed as well by critical social theory, leading to *effective schools and instructional leadership* models (Mitchell and Sackney 2011). The result was an improvement on formal leadership, but with a complex social dynamic in education such efforts resulted in school leader overload from tracking people and group performance within only slightly less bureaucratic conceptualizations disguised as instructional leadership (Hargreaves and Fink 2006). Results have been disappointing for years (Cuban 2001). At the same time, education technologists integrated Bandura's social learning into learning environment designs with personal-level computers and constructivist pedagogies.

From 1990 to 2020, more subjective and holistic ***open-system*** education models emerged for a newer generation of less formal leaders interested in leading from a premise that change is constant within and outside our education institutions. Learning from bio sciences, leadership research is finding that less formal, ***open systems*** are like living systems, and that natural scientists have proven that the only stable system on earth is a dead system (Cilliers 2000). So the formal leader/organization goal for stability and steady-state conditions seems a fallacy. Yet formal leadership and organizations still assume stable systems (Fullan 2015). By contrast, leaders in open systems are *aware of their context in the environment, often creating flexible teams spanning* institutions boundaries (Bertalanffy 1968; Kowch 2013). We have learned that open systems are in *constant flux*, so leaders can only understand them in the context of the environment or ecosystem (Gharajadedaghi 2011). This may seem like 'common sense', but few of our education planning, finance, policy or innovation processes consider more than the old steady-states or linear adoption strategies despite billions spent yearly to achieve 'transformations' at the education institution level. Transforming education organizations today requires far more informal leader approaches with informal "structuring" (organizing) so that change can happen at all—has a chance to happen. Yet look around you and you will find bureaucracies and formal leaders of position—galore. Similarly, *living systems* are the kind of open systems that can allow a thriving team (Capra 1997, 2002) to work across role boundaries. Leadership in open systems means managing *upward* or *across* relational elements such as organizations or teams that are, paradoxically, composed of individuals that co-connect (Barabasi 2003) and influence one another, tending toward far less formal, self-*organizing* with less formal order (p. 57). These connections can be described and understood as networks (Granovetter 1973) of co-dependent, less isolated people, yet informal leaders are not ad hoc.

Recently, a community *reform/transformation leadership* models have emerged to address the heterogeneity of individuals and people doing more than creating

learning outcomes or stable budgets in the co-dependent work of instruction, including empowering people (Sergiovanni 1989; Leithwood and Jantzi 2005). Again, however we should remember that most research on leading education institution (organization) transformation offers little evidence that such institutional reform thinking has impacted learning achievement (Leithwood and Jantzi 2005), and we have found that reform/transformation leaders, labeled "transformational" leaders, often become "profoundly egoist" with their super-charge to empower employees toward better (Gronn 2002). Transformation *language* has exploded with innovation and change rhetoric where most transformation is actually found to be an incremental change in small subsystems at best (Kowch 2015), and so the term "transformation" remains popular and widely juxtaposed with "change." Less formal leaders in open education organizations, especially those working with digital innovators need a much better concept for leading deep change in education systems. This author considers ***transformation*** an organizational phenomenon where *the process* (teaching, administration, socializing) of education changes fundamentally, as does the product of education (learning outcomes, social impact). Today, ***education technologists are leaders*** in expensive "smart" learning, AI, and Big Data-informed learning environment designs for more self-directed, cloud-based, technology-supported infrastructures that may afford a reconfiguration of education leader thinking to include innovation and not just the adoption of innovations (Ifenthaler 2017; Spector and Ma 2019).

> We must reconceptualize change, leadership and organizations to become better leaders now by evolving our leadership knowledge for a new context. (Levin and Fullan 2008)

This author has proposed a ***new, less formal paradigm*** for leaders working toward less formal and more integrated education system connecting IT, leadership, change, and learning environment by taking a complexity theory approach to create transformation through *innovation* (Kowch 2018), not transformation by technology adoption. The future of the educational technology subfield in education could depend on such a shift, because education technologist and leadership theory and practice may be overspecialized and disconnected from learning too much of the time (Kowch 2013b). Today, more *relational* and less formal co-dependent conceptualizations for leading education systems, power, labor, and change inform leaders "coaching" highly connected, *constant-flux education network structures* in more participative learning contexts via more distributed leadership (Hargreaves and Shirley 2012; Harris 2008). This is a refreshing idea for digital innovation team members who attract experts from across the organization for specific problem-solving and who work outside their traditional 'specialist' boxes to identify and to solve education system innovations that can (and do) change the product and processes in schools and universities in constant flux. However, artifacts of outdated education systems remain so that meritocracies (formal schools) can penalize informal collaboration, constraining people and chances that the organization could transform. We recommend starting digital transformation and organization transformations with informal digital innovation leadership in *teams* carefully designed to operate as subsystems within large formal organizations for this reason. Rome was not built in a day, and it is not structured for radical change—but change can evolve

from subsystems experimenting with less formal leadership in more open system teams, skunkworks and cross-disciplinary structures or networks found or already operating within—Rome.

Defining *complex adaptive leadership* (Sect. 9.4), Uhl-Bein et al. (2007) reconfigure how informal leaders understand ***power***— as a form of energy to facilitate, orchestrate, and share innovative ideas and outcomes throughout the organization where leader networks generate complex ***pro-innovation*** environments with complex (but knowable) dynamics and innovations-to-organization transference (p. 315). Less formal ***change leaders*** are similarly identified as "fourth way" change leaders who are able to focus on systemic and sustainable change with an inspiring, inclusive, and innovative mission (Hargreaves and Shirley 2012, p. 10), so for these leaders *doing the right thing* means "letting go" a little while building *flexible* organizations (houses) along with capable innovation teams. We need to assure that the "house" is be less formal, less structured so that it can handle change brought by collective innovation in an open network of people with the right knowledge and abilities to experiment and scale up innovation across our education systems today.

9.3.2 *Informal Organization:* Creating Adaptive Spaces for Digital Innovation Teams with People, Power, Systems, and Change

> The challenge is to identify alternatives [to bureaucracy] and develop theories that account for them. It is not trivial. How can we improve upon, even replace, such a painstakingly well-developed concept of how human beings collectively best accomplish their objectives? (Child and McGrath 2001, p. 1136)

Human resources (people) relationships, knowledge, and skills related to innovation projects matter more in less formal social organizations that "house" dynamic work and innovation (Clegg et al. 2011). We know that leaders and leader collectives do more than lead (or follow) employees in schools and university organization "structures" or spaces and that they can work across departments and institutions with fewer formal network arrangements (Kowch 2015). We have previously explained that informal leadership is a shared or ***covalent influence (not power) network of relationships*** formed among people in ***open*** organizations with a purpose. Informal organizations are collections of people and leaders who are less separated from one another while working in constant-flux *disequilibrium* (Kowch 2015). Informal network "structures" have always been part of the setup of structures and flows of resources, power, and ideas in ***open, relational networked learning organizations*** (Kowch 2015), where people work together toward purposes (McLellan 2010); however, leadership theory has not recognized this informal "who you know" condition well enough. In these ***complex adaptive systems***, change and innovation are much more likely, as is transformation (emergence) when the system members and leaders share influence (power) to imagine a different organization reality (process and product) through experimentation/innovation by doing more

than adopting a technology in a linear fashion (Rogers 1962). A good example comes from COVID facing North American breweries that innovated their processes and products by "attracting" toward a more sustainable, caring organization purpose in the ecosystem. They adapted into hand sanitizer producers by experimenting with their alcohol production process.

In the next section, we elaborate on this informal kind of organization to offer guidelines for creating highly capable digital innovation network teams that experiment to create organization-changing experiments that can transform complex adaptive schools and universities into organizations with adaptive spaces. Now that we know how to share influence and create space for digital innovation teams, we need to know how to empower them so their experiments can lead to system-wide transformation more often.

9.4 Toward a New Theory for Practicing Organization Transformation Through Digitization Innovations

9.4.1 Formal Innovation: An Addiction to Adopting Technology in Closed Systems

Doing innovation work is challenging in formal organizations. Everett Rogers defines *innovation* as

> *… an idea, practice, or object that is perceived as new by an individual or other unit of adoption…[and] It matters little […] whether or not an idea is "objectively" new as measured by the lapse of time since its first use or discovery. (Rogers 2003, p. 12)*

Education change scholar Michael Fullan describes a wider context for education innovators who must consider at least three interdisciplinary innovation practice imperatives: (1) using new curriculum materials or ***technologies***; (2) using new teaching strategies or activities, and (3) altering pedagogical assumptions. Educators attribute innovation diffusion models as models for incremental change (Licht et al. 2017). Sadly, a lot of education leaders do not go beyond simple education technology adoption practices because they do not understand the field or innovation well enough.

Innovation diffusion is an incremental approach to leading change and so too is the *diffusion of innovations* model (Christensen et al. 2008), because they both model linear adoptions of new ideas and technologies (such as distance education). Both are immensely popular formal models of closed-system, institution-bound, rule-based linear innovation based on rules in steady-state conditions in business; however, schools and universities are far from steady-state entities (Kowch 2020, in press). Christensen's model does not create disruption, rather it maps user preference value shifts that are usually accidental, so they do not apply well for change leadership in education.

Education change scholar Andy Hargreaves warns sharply that formal-approach education leaders have created a tragedy in schools by adopting innovations without

considering whole school or community (ecosystem) benefits (Hargreaves and Shirley 2012, p. 24) by placing digital innovations in a box not well enough connected to the life of organization networks. Congruent recent meta-studies of literature in the educational technology field indicate that scholars are also "too technology–centered" (West and Borup 2014), so many sources point to a need for a paradigm shift in the field toward less linear, isolated technology adoption for a post-structural, integrated interdisciplinary leadership approach policy and computer science fields (Kowch 2013a, 2013b, 2019). Innovation, digital or not—that transforms an organization from a caterpillar to a butterfly, for example, means doing much more than adopting technology per Rogers' S-curve (1962) which is, in fact a linear market model constraining education system thinking today.

Limits to the formal diffusion model in education include its genesis as a ***market capture model*** and that model focuses on *individuals* motivated by peer example and personal safety (I had better do this) in early majority phases (Fig. 9.1), or uncritical employee compliance in phase 4—accounting for over 85% of total adoption of any innovation (Rogers 1962). Also, the innovation diffusion model presumes that ***static innovations*** (unchanging) and innovation bias (***novelty***) for individuals drive too much of the adoption unconsciously. As well, planners find the elastic time scale for adoption phases problematic (Zhai et al. 2018). Education technologists have also been preoccupied with the adoption of a good learning technology too much, say some (Bodily et al. 2019).

The innovation diffusion model works for leaders implementing technological innovations that are ready/mature enough to enhance specific organization processes or transactions (micro-level change) in schools or universities. Formal to its core, the innovation diffusion model requires over-specialized laborers (gatekeepers, champions) (Rogers 2002, p. 332) assigned to smaller, less adaptive organization "spaces," bounding digital innovation teamwork in a market model frame. Formal innovation is expensive and slow getting done too.

9.4.2 Getting Digital Innovation Experiments Done: Developing Digital Innovation Teams

We have explained that ***complex adaptive system*** is an open and dynamic whole composed of a large number of parts operating in unsteady or constant-flux conditions, each of which behaves according to some rule or energy that relates it interactively to other parts as an open system but is not predictable as an incompressible system (Cilliers 2000). At the digital innovation team level, these networks get the work of innovation done across more open organizations. That work is often driven by tensions about the future of the organization by people who respond with an experiment (pilot, trial, research). When we understand schools and universities as complex adaptive systems, we consider relational dynamics among people in *their most creative, adaptive contexts* (Arena and Uhl-Bein 2018) within less formal organizations. Emerging from chaos theory, *complex adaptive systems*

> … exist when 'parts' of their relational networks are capable of learning, using rules that they themselves evolve… usually emerging from what is effectively a decentralized…process of co-design. *(Maguire et al.* 2006*; Kowch* 2018*)*

Individuals in most innovation teams get work done within relational networks spanning usual organizational boundaries. This goes beyond 'who you know' thinking by accepting that systems and structures do work in education organizations, but that the skills and talent needed to conceptualize deep innovation requires specific patterns and connections of people in a changing institutional ecosystem. Unlike formal leaders, this researcher finds that most informal leaders are unaware of individuals' influences, say, as leaders in the nonlinear "doing" and leading of their innovation work (Gereluk et al. 2016). In concert with complexity theory, this is because a change by one part of the ecosystem can result in disproportionate changes elsewhere (Capra 2002). Our research finds repeatedly that relational networks in education systems can thrive with reciprocal, shared (distributed) influence, not power-over, so that power is shared among these networks with high-capacity, decentralized patterns or clusters find *autonomy* and freedom in less formal self-direction during both large school (Kowch 2005) and university (Kowch 2016) innovation design and deployments.

> Only leaders who are equipped to handle a complex, rapidly changing environment can implement the reforms that lead to sustained improvement. (Levin and Fullan 2008, p. 292)

Leading ***change*** as an informal leader means *going beyond adopting* change theory models to create change in schools and universities (Cabrera and Cabrera 2019). From a recent collection of systems thinking theory in Springer's major reference work, *Learning, Design and Technology* (Spector et al. 2020), section editor Kowch found a clear trend among educational technology scholars, proving that *innovation leaders today trend toward more informal systems thinking* about education processes to lead technology-involved systemic change (Kowch 2019). Informal systems thinking leaders do lead change differently. Compared to formal leaders who apply systems theory to solve input-process-output-feedback type problems, informal leaders *experiment and build from t*ensions to alter what a school or university does (process), and how it impacts an ecosystem (products, outputs) as a whole. For example, most formal IT leaders in 75 school districts were found to adopt cloud technologies to ease cost pressures (Holwoka 2018), whereas some less formal IT leader teams created private clouds to ease tensions and risks arising from teacher security concerns. Later in this chapter, we explain how to create and lead high-capacity adaptive innovation teams.

Systems thinking affords leaders a method for aligning how we think about our organization process and outcomes within the context of a wider ecosystem involving individual and collective action within and beyond 'institutional' boundaries.

> The real world works in systems – complex networks of many interacting variables. . . systems thinking is the field of study that attempts to understand how to think better about real-world systems and the real-world problems we face. (Cabrera and Cabrera 2019)

Beyond the scope of this chapter, specific concepts and tactics for digitization innovation teams (networks) and leaders enacting informal organization level change

can be found in *Conceptualizing the Essential Qualities of Complex Adaptive Leadership: Networks That Organize* (Kowch 2013a). In sum, a ***high-capacity or highly capable network organization such as an innovation network*** reaches its goals when each member exhibits the following seven characteristics: (1) managing complex tasks, (2) generating answers to new problems, (3) rising above self-interest, (4) relating as part of a cohesive network, (5) understanding clear roles, (6) acting with clear values, professional values, and (7) generating new information when necessary. The *dynamics* of high-capacity network teams depend on the following five characteristics: (1) relation types (i.e., technical, political, social, informational), (2) actors change over time,; (3) resonances (predatory, competitive, symbiotic) among patterns of people, (4) attractors that motivate cohesion and action, and (5) aggregate capacity to organize interests and set goals (p. 170). Network structures are analyzed and designed using modified social and policy network algorithms (Kowch 2003, 2018) using computer network analyses. Critical network features are (1) centrality, (2) density, and (3) clusters. ***Attractors*** are also important qualities of generative or self-empowering networks (Hazy and Uhl-Bien 2015). Manifest in network members, attractors draw people with skills and knowledge (and fewer department formal boundaries) to coalesce as networks for problem-solving.

Innovation leaders who are attracted to lead informal organizations (like digital innovation teams) create these more autonomous network teams from interested, right-knowledge-for-the-problem people attracted to participate to solve a problem or to experiment, then they disband. See *Towards Leading Diverse, Smarter and More Adaptable Organizations That Learn* (Kowch 2015) for more information.

Another unique feature of complex adaptive network teams, schools, or university collective is their capability to transform by developing a *new purpose, process, and outcome* from previous ones, dynamically (Goldstein et al. 2010). This holistic transformation is called *emergence*.

Now that we have explored the kind of leadership (informal) that creates space for innovation teams to experiment and thrive, along with organizations or "structures" that allow for innovations to change the organization itself, we are ready for a model to help build, lead, and experiment with digital innovation teams so that the organization can transform from those digital innovations.

9.4.3 Identifying the Cusp of Change on Our Way to Organization Transformation: A Critical Moment for Innovation Team Leaders

> The real voyage of discovery consists not in seeking new lands but seeing with new eyes. (Proust 1923)

An experiment can offer the DNA for a new school or university, but as informal leaders we need to be able to—or we need the capability to—identify that experi-

ment, among many, as organization leaders—and that's a new skill. This author has studied over 300,000 participants in large school and university system change/innovation studies over decades, finding that the vast majority of educators maintain a formal understanding of leadership, mostly because of the intensely bureaucratic nature of our organizations and traditions.

Ecologies of innovation require constant-flux conditions and open innovation conditions much as schools of fish require simple rules to work together without colliding (Cilliers 2000; Chesbrough 2020). *Open innovation* is a general concept in harmony with complex adaptive school and university leadership thinking (Chesbrough 2020). Nonlinear and whole-system descriptions are possible and easy now with powerful computers and analytics, but *leading* them requires whole-system innovation perspectives of real and deep change where *generative tensions* inside the organization (school, university) are drivers within robust relational networks of people interested in changing the process and product of education (Goldstein et al. 2010; Kowch 2019). A great research team with a relational leader is a good example of such a collegial, effective school staff as is a university 'skunkworks' team. ***Inside-out and community-connected experimentation,*** supported by formal leaders but ***influenced by networks of individuals from these soft structures, can lead to novel experiments offering a new DNA for a school activity***, and these can be amplified and recombined in the complex system as it adapts. A completely new organization can emerge. Figure 9.2 shows the integration of diffusion innovation thinking in Stage 2 and 3 so that innovation diffuses throughout the ecosystem, not just as work or supervisor responsibilities aimed at 'change'.

The concept of ***emergence*** is equivalent to what some educators call 'transformation' as a caterpillar turns to a butterfly (Capra 2002; Stacey 2001). This staged development model for complex adaptive organization evolution depends on an experiment or set of experiments (i.e., digital innovations) "at the cusp of change"

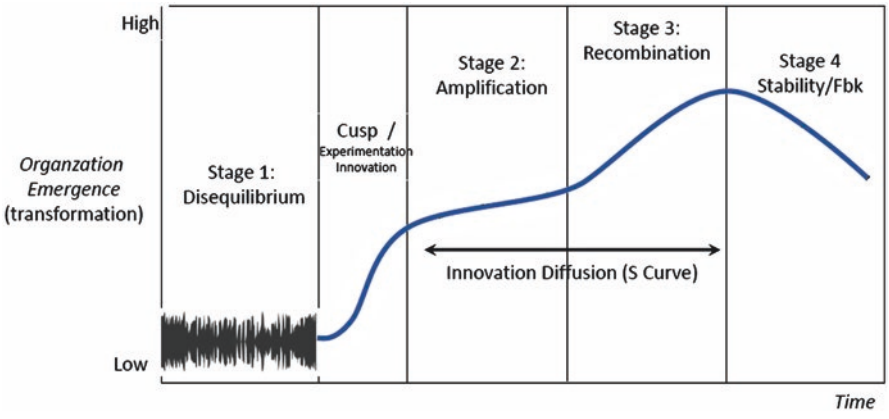

Fig. 9.2 Organizations doing the wrong things for the outcomes they imagine know that they are *Stages of Organization Emergence (transformation) in a Complex, Innovating School or University Over Time*

(Goldstein et al. 2010) that change the process, product, and ideal of a school or university. The concept also *lessens the separation of individuals from organizations during innovation* because a relational network of people ***collaborates*** to experiment and find the DNA for a new organization (school, university), often with digital technologies (Ito 2018). Moving university leadership and organization theory forward, we should conceptualize transformation as emergence and this will free us from the old, linear (piecemeal change) mentality brought by years of technology 'adoption' thinking, for example.

A good example of emergence (transformation) was found in our research study of a school where enrolments were down, staff churn was high, and funding was limited (Gereluk et al. 2016; Kowch 2013). Faced with declining enrolments, staff turnover, and funding shortfalls, the superintendent discovered that the community in the school's ecosystem grieved about the loss of a first national language. Seeing that as a binding value and as a generative tension, that leader worked with teachers, parents, and external funders to reimagine a language curriculum with new technologies and to shift the school's purpose toward learning "around" the lost culture and language. The result was a well-funded industry–school partnership, less turnover, and full enrolment—true emergence (Kowch and Gereluk 2013).

Organization emergence (transformation) occurs in four phases (Table 9.1): (1) disequilibrium, (2) amplification, (3) recombination, and (4) feedback and relative stabilization (Goldstein et al. 2010, p. 82).

Against the backdrop of huge formal bureaucracies in education that are often unaware that they are in a state of diseqeuilibrium, emergence depends on digital innovation experiments "at the cusp of change" developed by smaller, more autonomous parts of networked organizations led by informal leaders described in this chapter. Those are the seeds for true transformations with digitization. Next, we explore guides for leading those teams.

9.4.4 Leading Learning Organization Transformation/ Emergence with Digital Innovations: A Guide for Leaders

We have created a guide for leading education organization emergence as this way of thinking evolves for practical use. Emerging (transforming) schools and universities have four essential qualities: (1) diversity and redundancy among members, (2) experimentation, (3) intricate networks of relations, and (4) *innovations conferring new adaptive possibilities* (Goldstein et al. 2010). Also conceptualized by Cilliers (2000) as ***ecologies of innovation***, complex organizations are (1) diverse, (2) experiment-prone, (3) interdependent systems connected by interactive networks, (4) laden with innovation and new functionalities, and (5) always experiencing critical tensions and periods of instability. Because complex adaptive networks are incompressible, these networked teams are more than the reduced sum of their parts:

Table 9.1 The characteristics of digital innovation team leaders in each stage of emergence (transformation)

Stage of emergence[a] (transformation)	Stage characteristics	Digital innovation leader actions
Stage 1 Disequilibrium	Top-down structures cause instability and generative tensions. Intentional or planned 'jolts' move people to see new purposes compared to existing purposes. Left untended, the systems can evolve into chaos (not good).	Learn informal, network organization and leadership concepts. Imagine informal trials within existing bureaucratic contexts (pilots). Employees and leaders are perturbed about the direction of the organization.
Cusp of change	Informal networks, inclusive of leaders are newly attracted to a new purpose for the organization. Generative tensions abound, leaders empower risk and experimentation so that new products and processes can be tested. Successful experiments are the DNA for an emerged (different) organization. Transformed. Consider digital technologies in the knowledge economy	Generative leadership begins. Recognize network tensions. Co-design high-capacity interdisciplinary (learning, instruction design, IT, finance, policy) network teams. Empower risk and innovation. Identify new attractors/purposes held by the networks. Resource experiments. Seek new processes and products. Avoid linear technology adoption processes (champions, technologies 'off the shelf').
Stage 2 Amplification	Experiments have resolved organization tensions. Move to implementing the innovation (experiment). Possibly reconfigure key experiment network members to lead innovation diffusion and scale-up. Formal organization concepts work well.	Innovation adoption. Experiment leadership networks disband, resources are reallocated to implement experiments and innovation. Innovation diffusion occurs. Incremental change leadership, systemic change leadership. New partners and interdisciplinary teams are resourced to institutionalize innovation diffusion (Rogers 2003). Ecosystem should offer new value. Design-based thinking. Implement research to track value accrual.
Stage 3 Recombination	Institutionalize new processes and products in more traditional ways. System inertia is overcome. Reaggregations and recombination/ reorganization and policy development for innovation-based organization process result in new organization 'units.'	Reorganization. Identify novel structures emerging. Maintain informal organization and leadership, consider entrepreneurial activity and social impacts, value continuous improvement and reform.
Stage 4 Institute stabilizing feedback	Informal organization systems are stabilizing. Self-reinforcing feedback strengthens structures. External feedback anchors researched/ measured success.	Planning: Prepare for disequilibrium as the changing ecosystem around the organization offers new purposes and tensions for the organization. Avoid formalizing everything.

[a]Adapted from Goldstein et al. (2010), Hazy and Uhl-Bein (2015), and Arena and Uhl-Bein (2018)

> When carbon, oxygen and hydrogen atoms bond in certain ways to form sugar, the resulting compound has a sweet taste threat is not in any of the separate atoms themselves. (Capra 2002)

Just as sweetness is an emergent property of sugar, process and product change is an emergent property in a complex adaptive organization. The challenge for informal digital innovation leaders in this context is to *be able to identify the stages of emergence*, to *allocate* energy/resources for experimentation (and risk), and to *recognize* attractors or tensions among *employees*. A diverse digital innovation team can design and test new experiments, noticing experiments that could put the entire organization "cusp" of transformation because they contain a new process and product DNA (Goldstein et al. 2010; Kowch 2018; Donaldson 2019). When complex adaptive teams experimented to find new processes and products with a new purpose in mind, they transformed their colleges. This is far ***beyond linear, incremental change*** afforded by teams adopting digital technology, and this is **emergence—genuine transformation** from innovations created by innovation team networks. Table 9.1 explains the work leaders should do at each stage of emergence.

Digitization is the technological transfer of information (flows) and tasks to a computer, allowing digital transformation when an organization changes due to an increase in IT (Chanias and Hess 2016). ***Digital maturity*** describes what an organization has already achieved in terms of changing products or processes while developing a meta-ability for leading the change process (p. 4). Recently, educational technology scholars have found that digital maturity depends on *understanding and managing continuous change that helps to better facilitate organizational transformation* (Ifenthaler and Egloffstein 2020). For informal education organization leaders, digitization means developing leaders and organizations for optimal digital maturity. That work is a function of strategic asset development (digital intensity) and leadership (management, vision, governance) (Chanias & Hess, p. 6) we discuss here as leadership and organization.

Emergent universities such as the University of Phoenix have used these more formal leadership approaches to transform themselves (Hughes 2006); however, most schools and universities retain formal inertia with linear 'app adoption' mindsets for localized change (Hargreaves and Shirley 2012). The same has been found from researching college leadership teams (Donaldson 2019). So leading digital innovation well will matter more at the dawn of Big Data, Analytics, AI, and robots (Seiler et al. 2019). Scholars warn that ecosystem-driven generative tensions could shape well-made or very poor learning organizations with short futures (Kowch 2003, 2018).

In sum, leaders in adaptable relational innovation team-based networks need to be aware of new leadership approaches that allow people to bring their knowledge and skills transformation challenges as they are co-developed. This means recognizing critical experiments and digital innovations that have the DNA for a new education organization (school, university) with new ideas, processes, and products – a different future. It also means taking digital innovations, proven by testing, forward across the university ecosystem, not just for use within the organization's present

boundaries, and to diffuse and amplify the innovation as the whole organization transforms. This work is far from adopting a widget to create a better output or budget line.

By way of a summary for the chapter, Table 9.2 offers a guideline for practicing innovation network leaders in less formal *organizations* (school districts, schools, universities, faculties, departments) so that there is a complementary "space" for "cusp of change" digital innovation diffusion across the institution. In Phase 1, leaders simply need to be aware that they need to create networks from across the ecosystem to address organization tensions (challenges) of importance. In Phase 2, leaders amplify those innovations so that the new processes and products become the focus of the entire university or school. Of course, if the organization and leadership work has not been right up to this point, there will be no adaptive space in the organization so the innovation will stall.

One good example of emergence is Netflix. Beginning with an organization's purpose to create and rent entertainment DVDs, a group of employees eventually noticed that the Internet would allow digital transmission of movies online. They experimented to find a way out of obsolescence because no mature digital innovation encompassing re-organizing and distribution existed. They developed a new purpose to build their capacity for streaming movies. Experiments yielded new vendor contracts and production companies driven by that tension among employees attracted to a new goal: provision for streamed entertainment eventually leading to cloud-based streaming entertainment reshaping the industry. The company emerged (Goldstein et al. 2010; Pant and Yu 2018).

Table 9.2 A two-phase model for leading innovation-driven digital transformation in adaptive schools and universities

Phase I: Leader network ***Awareness and experimentation***	Digital innovation leadership for transforming schools and universities: characteristics
	1. Develop an *ability and mindset to identify or create tensions* and *attractions* that generate digitization experiments by teams resolved to solve those organization level problems.
	2. Develop diverse, redundant interdisciplinary (high capacity) *distributed network teams* to get work done. In doing this, the innovation network will define new purposes and processes within this informal organization for a different future.
	3. *Facilitate and resource*/empower risk and experimentation with technologies in core purpose contexts.
	4. Validate experiments (rapid prototype, research).
Phase II: ***Amplify innovations*** across the ecosystem	5. *Enact innovation diffusion* by expanding the experiment across the organization and its ecosystem. Strive for *digital maturity.* Use *system thinking* to lead systemic change.
	6. Dissipate the leadership networks, *institutionalize* the new organization as an informal organization with policy-making.
	7. Watch for new generative tensions and experiments.

9.4.5 Concluding Remarks

In this chapter, we argued that learning organization transformation is more likely in a future with less formal leadership and structuration (organization) of the work we do in education.

First, we showed that formal leaders restrict interaction and innovation by separating people from the challenges and innovations that might change schools and universities. Formal organizations similarly restrict the "space" for digital innovations by creating rules and vertical, functional hierarchies limiting interaction among people with different knowledge and skill sets across the school or university ecosystem. Even when transformative digital innovations emerge, they have difficulty lasting because the organization is not adaptable enough.

Next, we explored less formal leadership that can connect knowledge across "job" boundaries with a wider vision for networked innovation experiments using social and values-oriented guidance. We then explained high-capacity network team structures or patterns that decrease the separation of people (in jobs) from innovation work spanning the institution. That allows for experiments driven by the digital innovation team to identify the process and product DNA for a different school/university.

We close with guidelines for leading these teams and digital innovation through the stages of development that a university follows when transforming (emerging) so that a new university emerges.

Further research is required to help education systems identify tensions, develop new purposes, and mitigate formal epistemologies in the context of digitization. In addition, we need research helping us understand the attractors that draw innovators to a team, and the resource issues that come with ecosystem-level change leadership and more research done to describe and interpret sudden or disruptive change with digital innovation so that we can map intentional vs. chaotic emergence from digital innovation. Education systems are changing—but our leaders wear the suits of another era and work to maintain a house from the last century - this limits experimentation and the scalability possible through digital innovation. With mindsets considering complex adaptive ecologies of education, our new leaders are learning these skills now - will the universities and schools of tomorrow be ready for them?

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Chapter 10
The "Digital Facilitator": An Extended Profile to Manage the Digital Transformation of Swiss Vocational Schools

Alberto A. P. Cattaneo, Luca Bonini, and Martina Rauseo

10.1 Introduction

In a framework in which digitalisation has strongly reappeared on the landscape of education policy—and of vocational education in particular—there is a significant need to fully develop digital competence. This has happened not only when focusing on the skills people need to be responsible citizens (see, e.g., the DigComp initiative: Carretero et al. 2017, and the Swiss initiative: Swiss Confederation 2019) and active professionals but also when focusing more explicitly on the field of education. In this respect, the digital competence of the teaching staff is essential, and one of the most acknowledged initiatives relates to the European Framework for the Digital Competence of Educators (DigCompEdu) (Redecker and Punie 2017).

Within this general framework, the Swiss Confederation also issued a series of initiatives focused on the need to implement the digitalisation of its training system and its teachers (Swiss Confederation 2017a, 2018; EDK-CDIP 2018). As a federal centre of competence, in 2016, the Swiss Federal Institute for Vocational Education and Training (SFIVET) developed a Certificate of Advanced Studies (CAS) for the professional development of digital competence, whose reference competence profile is compliant with the DigCompEdu framework as well as other profiles from the Swiss vocational context (e.g., Boldrini and Cattaneo 2011).

Although teachers can be considered to be key players in the digital transformation of schools (e.g., Niederhauser and Lindstrom 2018; Scherer and Teo 2019), and because more work is needed with respect to developing teachers' digital competence, institutional factors also play a significant role in effectively supporting this transformation (e.g., Petko et al. 2018; Tondeur et al. 2008; Vanderlinde et al. 2014). Therefore, it is extremely important to create the proper conditions to promote digital transformation in schools by effectively and fully exploiting the affordances and

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_10

added values of technology. Consequently, the existing CAS profile has recently been enriched with a new dimension to address this issue. In fact, the Cantonal Office for vocational education in Ticino was interested in defining the professional profile of an individual who—in addition to having the basic skills for digital teaching and instruction—should also help manage the digital transformation within schools. The objective of this chapter is to present the competence profile of a Digital Facilitator ("Animatore Digitale" in its original Italian denomination), its origins, the process for its development, and its specificities. We begin by presenting the context in which the initiative takes place, with respect to Switzerland and to vocational education in particular. We then summarise some of the theoretical elements concerning teachers' digital competence. Finally, we present the Digital Facilitator profile and the process through which it was defined.

10.2 Digitalisation and Vocational Education in Switzerland

When dealing with vocational training, the emphasis is simultaneously on two mutually essential, interrelated components of the system that are difficult to completely separate: the economy and education. This is also true in the case of Switzerland, which has one of the most effective and acknowledged vocational education and training (VET) systems in the world (Bonoli et al. 2018; Strahm et al. 2016).

A few years ago, as a result of some respectable and, at that time, pioneering studies (e.g., Frey and Osborne 2013; more recently Bührer and Hagist 2017), it was believed that a considerable percentage of professions would disappear in a short period of time as a result of digitalisation, automation and robotization. A new industrial revolution (also known as "Industry 4.0"), more powerful and drastic than all previous ones, was looming on the horizon (Brynjolfsson and McAfee 2014; Schwab 2016), generating a strong feeling of insecurity and instability in society. Over time, this alarmist and anxious emphasis was replaced by more optimistic positions, emphasising that "the interplay between machine and human comparative advantage allows computers to substitute for workers in performing routine, codifiable tasks", while simultaneously amplifying "the comparative advantage of workers in supplying problem-solving skills, adaptability, and creativity" (Autor 2015, p. 5; see also Pfeiffer 2018). Concerning Switzerland, a number of subsequent studies (e.g., Aepli et al. 2017) supported these more conservative positions; while there certainly has been a decrease in repetitive manual activities, other analytical and non-repetitive activities, which can hardly be automated, have also increased in the last 10 years.

While the debate is ongoing, the emphasis on the digitalisation of the job market has contributed to increasing economic and political awareness about the need to keep the state of the art up to date. Instead of being a source of insecurity and fear, digitalisation has begun to be perceived as a positive challenge and, above all, as an opportunity to be exploited in order to maintain certain economic advantages and to

remain globally competitive. In this sense, the state can create the economic policy framework conditions for a favourable environment. In January 2017, the federal government in Switzerland published a report in which five areas (labour market, research and development, sharing economy, digital finance and competition policy) and the related challenges were analysed in-depth (Swiss Confederation 2017b). From the analysis, eight concrete measures to improve the framework conditions for the digital economy emerged. These include one measure about an “in-depth analysis of the challenges in the fields of education and research and development (universities)” to “assess the horizontal and vertical impact of digitalisation on the education system” and to understand “whether vocational training (basic vocational training, higher vocational training) and Swiss universities (academic training) can make an adequate contribution in terms of preparing new employees” (p. 176). Six months later, in July 2017, a specific report on the challenges that digitalisation poses to training was published in which eight fields of action were identified (Swiss Confederation 2017a). The report confirmed the shift in emphasis on the need to train people to manage the digital transformation, e.g., focusing on the development of digital skills, computational thinking and the skills needed to conduct fundamental research in the fields of computing and computer science. This is fully consistent with the general assumption that the higher the level of training, the more the share of manual tasks decreases in favour of non-routine analytical and interactive tasks (Apeli et al. 2017).

Within this general context, vocational education has also developed strategies. In 2018, the Swiss government in collaboration with the VET stakeholders promoted a specific programme to further develop the VET system (see https://berufsbildung2030.ch/de/). The definition of the priorities was established through a voting process held in the second half of 2016. Digitalisation was perceived by 69% of the voters as a factor destined to have a very strong influence on the evolution of the system. Thus, it was the most important and urgent mega-trend to address (followed by upskilling, de-industrialisation and globalisation). Industry 4.0 will not drastically reduce the number of jobs; rather, it will replace certain occupations in favour of newly emerging ones that require new skills. Consequently, the underlying challenge needs to be scaled down and re-framed as the need to ensure basic training, continuing education and re-training of the workforce, starting from initial vocational education.

For VET, the issue is to ensure that the system evolves in a way that enables it to respond to the new needs of the job market. This means both promoting the emergence of new professions—and keeping existing ones up to date (Trede and Lüthi 2018)—and facilitating the development of the skills workers need to compete in this new type of economy, offering (re- and up-)skilling opportunities, where necessary. In line with international studies (e.g., Bauer et al. 2015; Loveder 2017; Pfeiffer 2015) and those conducted in Switzerland (Genner 2017; Scharnhorst and Kaiser 2018), attention has been drawn to the need to train apprentices on the necessary interplay between digital competences (in the strictest sense of the word) and transversal skills (e.g., related to problem-solving, critical thinking, creativity, flexibility, adaptability, resilience, time management, communication, collaboration,

entrepreneurship and interculturality), because the combination of these two sets of competences is valuable and effective for properly facing the digital transformation challenge.

10.3 Teachers' Digital Competence

As previously noted, the concept of digital competence is multifaceted and difficult to comprehensively define. While it is not possible to exhaustively review the significant amount of existing literature on this topic, we provide a brief overview of the definition of digital competence and then apply it to the specific professional target group of teachers.

10.3.1 The Concept of Digital Competence: A Brief Overview of Its Evolution

The concept of digital competence began to appear with some frequency in the literature in the late 1990s. At that time, the most widely used label referred to the concept as "digital literacy" (Gilster 1997) and emphasised the cognitive dimension, although, in practice, this often encompassed an approach more oriented to technical aspects and to individual tools and products (Menichetti 2017). In terms of literacy, a reference was implicitly made to a series of primary literacy skills that are necessary for anyone (Logan 1995), thus assigning the same status to digital literacy that is typically reserved for reading, writing and counting. The concept also included other contiguous literacies, such as computer literacy, network literacy (Pérez-Tornero 2004), information and communication technology (ICT) literacy, information literacy and media literacy (Martin 2005).

With the new millennium, the concept also began to make its way into European Union (EU) policies and to appear in several European projects. Within the framework of one of these projects, the definition of digital literacy was extended to include not only skills and attitudes but also a (meta-)reflexive dimension and a specific "awareness" trait (Martin 2005). The reference to the dimensions characterising competence (knowledge, know-how and attitudes, cfr. Le Boterf 1994) ensures that the concept of digital competence progressively replaces the previous one (Ryken and Salganik 2003) used in the official texts of the EU (e.g., Recommendation 2006/962/EC on key competences for lifelong learning). Since then, many different digital competence definitions and models have been proposed.

For example, Calvani et al. (2010) defined digital competence as a multidimensional, transversal, historically connotated, product-independent and declinable-in-various-contexts-of-use concept. They also proposed characterising it using three pedagogically significant dimensions: a technological dimension (not only allowing

an explorative attitude but also including the capability to select the proper technology with respect its ability to accomplish a task), a cognitive dimension (including coding skills, e.g., applied to three-dimensional [3D] printing and the development of computational thinking) and an ethical dimension (often connected to media education and related to a critical and informed attitude, e.g., with respect to security and privacy issues, to one’s digital footprint, to the reliability of news and to netiquette). More recently, Ilomäki et al. (2016) scanned the literature in search of a comprehensive definition of digital competence and showed its relationship with background disciplines and related terms. They concluded that digital competence is a multifaceted term consisting of four elements: “1. Technical skills and practices in using digital technologies […] 2. Abilities to use and apply digital technologies in a meaningful way and as an appropriate tool for working, studying and for various activities in everyday life in general […] 3. Abilities to understand the phenomena of digital technologies […] 4. Motivation to participate and engage in the digital culture” (Ilomäki et al. 2016, p. 671).

In terms of digital competence models, DigComp is the one most widely used in Europe; its 2.1 version has now been published (Carretero et al. 2017). A similar model has been proposed by the German KMK Strategy (KMK 2016), which is also based on six competence areas for an updated digital education. For a list of other pertinent models, see Ferrari (2012). Consistent with what we presented in the previous section, the basic assumption is that the international policies have to guarantee the development of digital competences for all citizens as a prerequisite (both in the sense of a right and a duty) so people can fully participate in the civic, social and professional arenas without any discrimination. In Switzerland, something similar to DigComp is also in effect (see Swiss Confederation 2019) to create the conditions in which every citizen can acquire and maintain basic skills, including digital skills.

10.3.2 Digital Competence and Teachers’ Professional Profile

Within this overall framework, this chapter pays attention to the digital competence that *teachers* need to acquire to be effective professionals in the digital era. In a sense, this constitutes an additional layer of competence, on top of the one, previously mentioned, applying to all citizens. The specific need to empower teachers and train them with well-developed digital competence is clearly and explicitly mentioned as one of the priorities and key actions in the main policy documents introduced earlier (Swiss Confederation 2017a, 2018; EDK-CDIP 2018). However, in this case, the issue is not a novelty. Several competence frameworks have been developed on this topic (see Kelentrić et al. 2017 for a short list). Some of the frameworks are more conceptual and theory-driven, while others clearly have a policy intent and are practice-oriented.

The Technology, Pedagogy and Content Knowledge (TPACK) model (Koehler et al. 2014; Mishra and Koehler 2006) clearly belongs to the former group, and it is

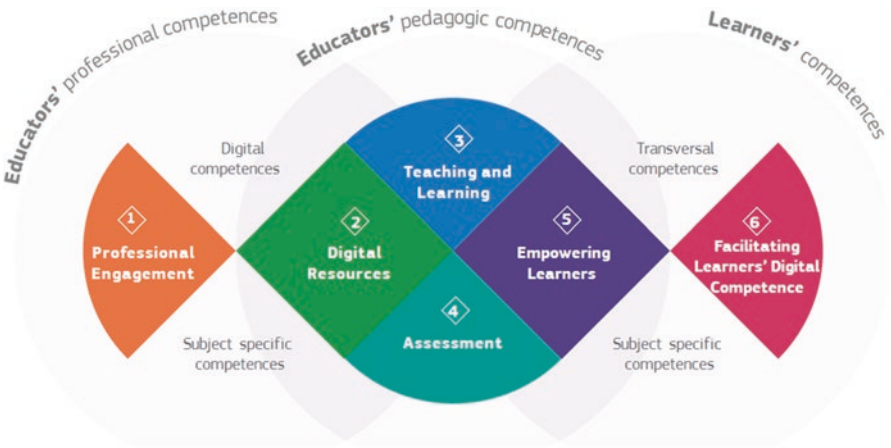

Fig. 10.1 The DigCompEdu 2.0 framework competence structure

probably the most well-known. TPACK proposes that teachers should develop technological, pedagogical and content knowledge. These three types of knowledge overlap and interact synergistically, thus revealing additional components (technological content knowledge, technological pedagogical knowledge and pedagogical content knowledge), in turn preluding to the essential core of the model, which is technological pedagogical content knowledge. Rosenberg and Koehler (2015) also emphasised the role that context knowledge plays in such a holistic integration.

As per the latter group, one of the most known reference is surely the DigCompEdu, the European framework for the digital competence of Educators (Redecker and Punie 2017). DigCompEdu organises a set of 22 competences in six main areas aiming to detail "how digital technologies can be used to enhance and innovate education and training". Each competence is then described for educators so they can achieve different stages of competence development and mastery. Looking at how the six areas are presented (Fig. 10.1), it is interesting to note that this framework, although focused on educators, also tries to integrate the learners' perspective (on the right), moving from the *professional* competence of educators towards the empowerment of their students through the mastery of the *pedagogical* component.

The Technology-Enhanced Training Self-Assessment Tool (TET-SAT)[1] and the Self-reflection on Effective Learning by Fostering the use of Innovative Educational Technologies (SELFIE)[2] are interesting tools connected to the DigCompEdu framework. Both tools are connected to European projects, and they easily allow teachers to self-assess their digital competence development. The former is an online self-assessment tool that aims to help teachers "develop digital pedagogical competence;

[1] http://mentep.eun.org/tet-sat

[2] https://ec.europa.eu/education/schools-go-digital_en

Engage more actively in reflecting on their pedagogical practice using ICT, stimulated by a structured self-assessment exercise providing feedback according to five levels of progression; […] Establish a personal competence profile which can be compared to other teachers" (MENTEP 2018). With a structure similar to DigCompEdu, TET-SAT is organised along four main dimensions (digital pedagogy, digital content use and production, digital communication and collaboration and digital citizenship) connected to 15 sub-dimensions. Each sub-dimension includes competences based on five levels of mastery. SELFIE, available in more than 24 languages, is "a tool designed to help schools embed digital technologies into teaching, learning and student assessment" that gathers and combines the views of teachers, students and school leaders on how technology is used in their school.

Looking at these two tools—especially SELFIE—enables us to emphasise how often teachers' competence models are finalised and combined with larger technology *integration* models that go beyond the skill component of competence to consider larger dimensions. In general, these models reveal that digital competence is only one component, necessary but not sufficient, to guarantee the effective integration of technologies in the educational context. For this to happen, it is necessary to work on competences in the strictest sense of that term, as well as on attitudes and beliefs at the individual level—as posited, for example, by the Will-Skill-Tool-Pedagogy (Knezek and Christensen 2016)—and on leadership and school culture at the institutional level (e.g., Christensen et al. 2018). Thus, it is also necessary to be aware of the close relationship between these two dimensions; for example, in a context where beliefs are difficult to change, the availability of leadership supportive of promoting technology integration can make a difference (Petko et al. 2018). In the Swiss VET context, Seufert et al. (2018) and Seufert and Scheffler (2018) also proposed a model of teachers' digital competence that includes different facets. These studies addressed teachers' digital competence as an *extension* of their existing professional competences. They start from the well-acknowledged model of professional teaching competence by Baumert and Kunter (2006) (see also Kunter et al. 2009, 2011), "which comprises professional knowledge, convictions in the sense of personally biased basic orientations, values, motivational orientations, and self-regulation" (Seufert et al. 2018, p. 95). The TPACK (being itself an extension of Shulman's 1987 model) is then considered to define professional knowledge when technology comes into play. As per the skills a teacher needs, Seufert and colleagues also refer to Blömeke's (2005) model, which not only takes into account the two core tasks of media didactics (teaching and learning with media) and media education (teaching and learning about media) but also considers the media-specific requirements of the learners and the school environment (including infrastructures and support structures). Finally, Seufert et al. (2018) noted that, apart from *product-oriented* models, such as TPACK, *process-oriented* and *action-based* models must be included when considering teachers' digital competence. Thus, in addition to the knowledge and skills required by the teachers and the organisational support structures, the attitudes and beliefs of the teachers and informal learning opportunities play an equally important and explicit role. This last point is particularly interesting, as it emphasises that teachers should develop their skills while acting (and critically

reflecting on action) in the informal context of their practice, and it reinforces the importance of learning communities, i.e., of an informal exchange with colleagues engaged in the same practice.

Proceeding on this track, it is possible to conclude our argument by considering how these micro- and meso-perspectives influence the macro, community perspective: the countries that are best able to profit from the digital transformation are those that can combine and promote both education and labour market policies, thus "integrati[ng] digital technology in the global education ecosystem" and "supporting educational reforms with proper teacher training" (UNESCO 2018, p. 1).

In this sense, it is worth mentioning the recent work by Aagaard and Lund (2020). They propose four dimensions (generic digital competence, didactical digital competence, professionally oriented digital competence and transformative digital competence) on which to ground the concept of Professional Digital Competence (PDC) in the light of cultural-historical activity theory (Engeström 1987). PDC goes beyond simple mastery. First, it requires appropriation. According to Aagaard and Lund (2020), "Appropriation differs from mastery in the sense that mastery can be exercised as control over tools; it is basically instrumental, unidirectional and manipulative. Appropriation, on the other hand, involves transformation of tools and contexts as well as agents but not necessarily without resistance" (p. 72). Appropriation is only one of the vital issues in the learning sciences that teachers need to connect to the affordances of digital technologies in order to develop their PDC. In the appropriation concept, as well as in the transformative dimension, we see a possible operationalisation of what was presented above as the interplay between digital competence as a trait of an individual and technology integration as something that occurs in a wider educational context and is related to the digital transformation process. Moreover, a second characteristic of the PDC concept is relevant for us when specifically dealing with VET. Specifying its *professional* component, in fact, Aagaard and Lund (2020) indicate that "competence is linked to work-life processes" and that "PDC for a teacher demands awareness of how subjects [as well as professions] change in a digitalized society; competences to relate school to such a changing society […]; the ability to identify and address ethical questions and dilemmas that emerge in a digitalized society […] to bridge current campus practices with (future) workplace practices" (pp. 78, 80).

Consequently, we define teachers' digital competence as a complex and reciprocally interplaying set of resources—i.e., knowledge, skills and attitudes—concerning teaching-and-learning *with* media and *about* media. The professional component includes the knowledge and skills related to the technological, pedagogical and content dimensions, as well as the attitudes (including beliefs, values, motivation and awareness) related to the digital world. This further implies the need to consider the composite and systemic interaction among the cognitive, metacognitive, ethical and contextual dimensions that digitalisation entails. In the case of vocational education, this also includes the consequences of digitalisation on vocations, on the skills requirements and on the world of work in general. It assumes mastery (e.g., of digi-

tal tools), but it goes beyond that to emphasise integration and appropriation—resulting from critical use and reflection on practice—of the dynamics between digital tools, people and contexts. Finally, it requires effective interactions between the individual and the collective subjects. In fact, it requires not only effective leadership and a supportive school culture and the presence of infrastructures and support structures but also the possibility of having informal exchanges with colleagues and of belonging to a community of teachers who profit from the informal and non-formal occasions of learning, as well as the formal ones.

10.4 Towards a Digital Facilitator Profile

In this overall scenario, the experiences promoted by the SFIVET also occur. We already referred to the initiative conducted years ago to define a professional profile consisting of 11 competences related to technology integration in vocational schools (Boldrini and Cattaneo 2011; Cattaneo and Boldrini 2009). The context was that of a large national project that was promoted at the beginning of the new millennium to incentivise schools to adopt educational technology to support learning. Therefore, the resulting competence profile for vocational teachers using technology was derived from two complementary efforts: the analysis of existing international frameworks and the analysis of existing technology integration projects in vocational schools. Moreover, in the official curriculum for teachers to obtain their federal teaching diploma, a module is dedicated to the topic. It considers many of the facets highlighted in the previous section, providing for a minimum level of digital literacy and addressing the cognitive, instructional, ethical, economic and societal issues related to digitalisation. However, as part of the basic training curriculum, the module only briefly addresses these issues; it does not delve into them deeply.

Thus, as a competence centre sensitive to the topic, in 2016, SFIVET also developed a continuing education programme under the umbrella of a Certificate of Advanced Studies (CAS) to further develop digital competence. However, due to the time constraints given by the structure based on two modules corresponding to 5 ECTS each, the CAS “Form@tore digitale” (Digital Tr@iner), was conceived with a strong emphasis on didactical and instructional aspects, lacking to delve more deeply into some of the other issues.

However, under the impulse of the most recent national educational policies, and profiting from the boost assured by the Cantonal Office for VET in Ticino (the Italian-speaking canton of Switzerland), we revised the profile of the Digital Tr@iner and at the same time identified the competence profile of an educator who not only fully integrates the affordances of educational technology into her/his practice but can also promote digital transformation within her/his educational institution. We refer to this as a Digital Facilitator profile, whose genesis is reported in the following section.

10.4.1 Procedure

The project was first organised at the cantonal level; at a later stage, it was extended to the national level. Locally, having received the mandate from the canton, a team of three people was created to manage the project. This operating group immediately constituted a larger accompanying and counselling group composed of practitioners in the field. In addition to representatives of the canton, this included people from the vocational school management, teachers from different areas and disciplines, information technology (IT) technicians and academics who are experts on digital competences in the field of education. The operating group constantly consulted with and periodically met the counselling group throughout the duration of the project and after each of the main phases described below. At the national level, one member of the operating group shared the results with the members of the national group in charge of defining the curricula for the courses (including the CASs), while everyone in the operating group participated in discussions about and validation of the competence profile with a larger national group of trainers and project managers from the three regional sites of SFIVET.

The project then progressed through the following steps:

Definition of a standard competence profile (as a starting point). First, the operating group conducted a comparative analysis of the relevant existing profiles. The competence profile upon which the CAS Digital Tr@iner was developed was compared with the frameworks mentioned earlier, in particular DigCompEdu, as well as the digital competence profile of the VET teacher already developed in the Swiss VET context (Cattaneo and Boldrini, 2007) and the official module offered in the basic training curriculum. In addition to these elements, the modules constituting the Federal Vocational Certificate of Trainer (Swiss Federation for Continuing Education, 2019) and the CAS of the Zurich High School of Education (PHZH, 2019), which offers a similar type of training, were also considered. This phase resulted in the development of the first competence profile, mainly related to the didactical and technological dimensions. The profile was fully compliant with the international frameworks that were considered, but it was also contextualised with respect to the specificities of Swiss vocational education and the effective ways to integrate technologies into vocational education (Schwendimann et al. 2015).

Validation of the first profile. The emerging profile was presented to the counselling group to be discussed and improved based on further reflections and arguments by the group; then it was validated.

Sketching the missing component for the full profile. The same meeting provided the opportunity to gather spontaneous ideas about additional activities and expertise that were needed to upgrade the Digital Tr@iner profile to the Digital Facilitator profile. After the meeting, the operating group systematised and categorised the collected ideas and compared the results to already existing profiles in the Swiss context.

Presentation of the Digital Facilitator profile, discussion and cantonal validation. In this phase, the completed profile was discussed again, then finalised and

validated by the counselling group. The consultation also included discussions on the practical and organisational aspects related to the institutional positioning of the resulting profile, as well as proposals for recommendations that should be made to educational policymakers.

National discussion and validation of the complete Digital Facilitator competence profile. The last step of the procedure focused on the presentation, discussion and validation of the full profile to a national group of SFIVET teacher educators, trainers and project managers from all three linguistic regions of Switzerland. For this phase, French was chosen as the common language. Due to the richness of the discussion and its implications, this step required multiple sessions, conducted in-person and online. It is important to note how the cultural component—mirrored in the linguistic expressions chosen to describe each competence (the profile was synoptically available in French, German and Italian) and the original correspondences in English to the international frameworks—affected the interaction, enriching the background as well as the semantic range of each label used to identify the competence. Each expression was then double-checked from and to the second translation language, thus assuring a higher consistency throughout the translations.

10.4.2 Results

The resulting Digital Facilitator professional competence profile is presented in Table 10.1.

The finalised Digital Facilitator profile consists of three levels, organised around four main areas. Each area includes sub-areas (for a total of 13, level 2) within which are found the basic building competences (level 3). Each competence is then described in detail in the full framework, which is not included in this chapter (the detailed version is available upon request).

10.5 Discussion

With respect to the two main competences that have been developed in the Digital Tr@iner profile since 2016, the Digital Facilitator profile extends the previous profile in at least three main ways: it includes a media literacy dimension, previously largely under-represented; it more explicitly considers the addressees of the trainer interventions, and then it is more oriented towards the development of the trainees’ digital competences; and it foresees a completely new key area related to the active promotion of digital transformation within educational institutions.

In general, the Digital Facilitator profile is fully aligned with the models described in the previous section of this chapter. With respect to the TPACK model (Koehler et al. 2014), the technological and pedagogical components and the ways in which they intersect are more evident than the content and subject-related component, in

Table 10.1 Competence professional profile for the Digital Facilitator

Competence area	Sub-area	Competences
1. Building a professional digital identity and culture	1.1 Professional development and commitment	1.1.1 Continuous digital professional development 1.1.2 Professional collaboration 1.1.3 Reflective practice and research posture 1.1.4 Digital identity
	1.2 Approach to technology	1.2.1 Curiosity and an open-minded attitude 1.2.2 Critical approach according to various perspectives 1.2.3 Digital resource choices
2. Integration of digital technology in training	2.1 Elaboration of the devices	2.1.1 Scenarisation of educational activities 2.1.2 Fostering the learners' involvement 2.1.3 Articulation and structuring of learning environments
	2.2 Appropriation of digital artefacts	2.2.1 Selection of digital resources 2.2.2 Development of digital resources
	2.3 Support for the learning processes	2.3.1 Interactions management 2.3.2 Differentiation and heterogeneity 2.3.3 Accessibility and inclusion
	2.4 Learning processes regulation	2.4.1 Evaluation strategies 2.4.2 Digital traces analysis
3. Developing the learners' digital skills	3.1 Learners' digital citizenship development	3.1.1 Encouraging responsible use 3.1.2 Fostering various types of collaboration through digital technology
	3.2 Digital resources and services promotion	3.2.1 Information literacy and media education 3.2.2 Digital problem solving
	3.3 Support for the production of digital artefacts	3.3.1 Learners' support in the creation of digital content 3.3.2 Raising awareness of the legal basis for using digital data
4. Promotion of digitalisation in educational institutions	4.1 Analysis of existing and potential needs	4.1.1 Proposals for innovative practices 4.1.2 Training needs inventories 4.1.3 Demand analysis
	4.2 Project development	4.2.1 Organisation of continuing education opportunities 4.2.2 Accompaniment for digitalisation projects 4.2.3 Project management elements
	4.3 Support/ accompaniment	4.3.1 Assuming the role of the digital facilitator 4.3.2 Accompaniment
	4.4 Interventions evaluation	4.4.1 Evaluation and assessment 4.4.2 Reflective posture

which the declensions and the transfer of the general principles presented in the course are directly ascribed to the participants. In fact, the composition of the classes is usually heterogeneous with respect to the disciplines of the participants and the subject matter they teach. While discipline homogeneity is fostered for some group assignments, most of the time heterogeneity is exploited as a means to de-centralise oneself, listen to other perspectives and enrich the possible transfer.

The six main areas of the DigCompEdu framework (Redecker and Punie 2017) are all taken into account, although the final structure is based on four main areas. However, one can see that the three main groupings of DigCompEdu are recognisable in the Digital Facilitator profile. Moreover, with respect to the previous version, an explicit reference to the orientation of teaching towards empowering the learners' digital competence is now present; looking at the single competence formulation, one can see that many of them evidently resonate with the DigCompEdu formulations. At the same time, we abandoned the idea of proposing different descriptions for each competence, according to the levels of mastery. That approach does not always allow the reader to clearly distinguish between the levels because sometimes they overlap.

Three out of the four components of the Will Skill Tool Pedagogy model (Knezek and Christensen 2016) strongly constitute the basis for the Digital Facilitator profile. The first dimension, related to teachers' beliefs, is more implicit and related to the first area of the profile, which focuses on professional development and includes an important component related to critical thinking and reflective practice.

We see the main foci of the PDC framework (Aagaard and Lund 2020) reflected in the Digital Facilitator profile, starting from the concept of appropriation (see above with respect to the simple identification of mastery levels), which also explicitly appears in the definition of one sub-area (the 2.2); to the relevance of the context and the role of digitalisation in the world of work; to the declination of digital teaching competence with respect to the specific professional context where the learners are active in their apprenticeship and the related challenge of learning across sites (Ludvigsen et al. 2011).

The reference to the institutional context and its important interplay with the individual competence—which is transversal to many of the above-cited models and highlighted in particular by the model of Seufert et al. (2018)—is subsumed in the fourth area, completely new and fully devoted to this aspect. It more fully characterises the specificity of the Digital Facilitator than the other three aspects.

Consequently, the Digital Facilitator is a professional who—in addition to possessing teaching skills related to the effective, critical and sense-making integration of technologies in the education system already emphasised by other profiles—integrates a strong media education competence. This is an important consideration given the ways in which digitalisation has changed the world of work, and it results in an orientation towards the development of learners' digital competence. Additionally, it seriously considers the specificities of vocational education, and in particular the articulation and interplay among and across learning sites (Aprea and Cattaneo 2019; Schaap et al. 2012). Thus, the Digital Facilitator completes her/his profile by developing knowledge, skills and attitudes (i.e., competence) aimed at

promoting digital transformation in educational institutions, which also assumes an updated and critical thinking attitude towards the digitalisation of the job market and of vocation profiles. This competence is especially related to the project dimension (including management aspects), the relational and accompanying dimension and the reflexive-evaluating dimension of the implemented interventions. A fundamental characteristic of the Digital Facilitator is that he/she is a resource for colleagues within his/her own school premises. Therefore, the Digital Facilitator becomes a reference both for digital teaching and for the concrete implementation of digital-oriented projects—from the smallest experiments to more structural implementations—in educational institutions. In this way, Digital Facilitators support their colleagues in the development of their ideas, promote their own ideas by bringing them to the attention of the entire teaching staff and motivate people that are more resistant to digitalisation. This also means seriously considering what Seufert et al. (2018) suggested with respect to the relevancy of informal occasions of digitalised practices and of a community of peers with which to discuss and compare one's practices. Whatever the situation, the Digital Facilitator will always approach the task in the most (constructively) critical spirit possible. The Digital Facilitator is not a technology promoter at all costs; he/she only does so when it has a real pedagogical and educational benefit. The Digital Facilitator is also characterised by a predisposition to experimentation and proactivity, as well as to listening, negotiating and collaborating with others. To adequately fulfil these tasks, it is important that the Digital Facilitator be open-minded and available for continuous training and skills updating, as well as being able to deal with other Digital Facilitators who may be facing or have already faced similar situations, thus contributing to building a new professional community or practice.

10.6 Conclusion

In this chapter, we addressed the question of whether a specific individual is needed to promote the digital transformation of Swiss vocational schools. Through a regional research-and-development project implemented in the Canton of Ticino and validated by a group of VET educators at the national level, we identified the professional profile of the Digital Facilitator. This person would add to the key digital competences that every teacher should possess, including specific competences in the logic of media education (including a critical perspective on digitalisation, in particular with respect to its consequences on the world of work and the development of professions). Above all, the Digital Facilitator should have specific skills to promote digital transformation within school institutions, acting as a hinge, an interface and a mediator between the school management, colleagues and other institutional stakeholders that are active in the territory.

This naturally requires coordination with educational policies, so that digital competence can be institutionalised and implemented in the field. Moreover, it is very important to create a reference community, especially since each school would

have not more than one Digital Facilitator (see also Seufert et al. 2018). This coordination has not been fully achieved yet. Although the project was born from the explicit political will to develop such a figure, in fact, the work is currently more the result of a theoretical reflection. On the theoretical level, we see its first implication: being grounded in international contributions about the digitalisation debate, in fact, it applies to constitute a possible general reference for managing and piloting the digital transformation of learning organisations, especially in the vocational sector. Ultimately, it is necessary to confirm and validate this profile based on evidence—which is the main implication for research—after its introduction into the real world of vocational schools, at least in a pilot project. Indeed, despite its theoretical grounding, the actual Digital Facilitator profile is strongly contextualised. Its validity, applicability and generalisability outside regional and national borders must be verified. Although the dual nature of Swiss vocational training has been strongly considered in the definition of the profile—for example by adding specific skills to the general reference framework provided by DigCompEdu—the experiences of promoting digital transformation linked to the business world have only been marginally considered. This could provide interesting feedback on the profile itself and on the articulation that a person, such as the Digital Facilitator, might have to promote and foster in order to be effective throughout the entire VET system and, in general, for any learning organisation.

The complexity of the resulting professional profile also suggests the need to investigate it by conducting further research on its competence components and the relationship among them (e.g., How in-depth does the project management part need to be? How important is it for IT skills to be a prerequisite for the Digital Facilitator? How can the Digital Facilitator’s position within the school be interfaced at the organisational level with the other stakeholders already in place?). Additional research is also need to determine how effective a Digital Facilitator would be in promoting digital transformation within an actual school.

The first step in this direction, and a strong premise for identifying the important consequences for practice, will be to reflect how to train a Digital Facilitator so that the training is anchored to professional practice. A proposal has already been made to restructure the former CAS and extend it to include four different modules that combine two different CASs, also possibly leading to a Diploma of Advanced Studies (DAS).[3] Based on the analysis presented here, and the other existing models considered so far, the training will emphasise the “experimental” approach in the field and will focus on more ways to promote sharing and collaboration, profiting from the existing community of already qualified digital trainers.

Finally, although digital transformation is already part of everyday life, from an educational point of view many challenges still need to be faced, especially in the

[3] In compliance with the profile, the four modules would deal respectively with: (1) the development of a digital learning environment; (2) digital education tools and pedagogical devices, where “education” includes both teaching and learning and learning at school and at the workplace; (3) media education, meant in the wide sense clarified above, strongly including a critical attitude towards the digitalisation of the world of work; (4) digital transformation project management.

VET context. Hopefully, the profile presented here can be a much-needed cornerstone in building a better digital future for the field of education.

Acknowledgements The current project has been co-funded by the Vocational Education Department of the Cantone Ticino, in the framework of the project "Definition of profiles concerning vocational teachers in the digital working environment". We thank all those who participated in the project, as well as the colleagues from the three regional SFIVET sites who contributed with their reflections, critics and comments to develop and define the final profile.

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Chapter 11
Sustainability in a Digital Age as a Trigger for Organizational Development in Education

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11.1 Introduction

The term *digitization* is originally used to describe the conversion of an analog into a digital system. The origin of *digital* is the Latin word *digitus* for *finger* and especially a *calculating finger* (Han 2013). However, within a post-structural perspective, digitization includes much more than that: Digital technologies have become major instruments for and in our lives. The logic of the binary code is determining social, technical and organizational systems. The architecture of algorithms, codes and data structures is embedded in materiality and infrastructure of our day-to-day life, provides space for communication, articulation, creativity and networking and, therefore, changes self-determination and subjectivization (Jörissen and Verständig 2017, p. 37). According to this, digitization designates a transformational process of social, socio-cultural, economic (Petry 2019) and – we would as well add – ecological structures from both, a local and global perspective.[1]

In the digital age, organizations are, amongst other factors, to a great extent also determined by digitality. New structures, new infrastructures, new jobs and job descriptions as well as new forms of collaboration within educational organizations and between educational organizations with other institutions are needed. In short, the digital age makes a fundamental process of organization development in the educational context necessary (see, e.g., Eickelmann 2010; Grünberger and Münte-Goussar 2017; Schiefner-Rohs 2017; Tulodziecki et al. 2018).

[1] In the German-speaking discourse, the terms *Mediatisierung* und *Medialisierung* are common (see, e.g., Bettinger and Aßmann 2017). The team *digitization* is rather used as a political and economic term than as a scientific concept.

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_11

Following a holistic perspective, we can see that digitization affects our living environment much more than previously anticipated. What we have to take into account are the connections "of media technologies, their materiality, hardware and energy, with the geophysical nature" (Parikka 2015, p. 8). Developing, producing, using and disposing of digital media has an ecological, economic and social impact on Planet Earth and our society. Digitization shapes our landscape, our environment and social relationships; sometimes, much more than we could ever have imagined.

As a development parallel to the digital age, individual and political efforts of climate and environmental protection are growing. According to that, educational concepts such as *Education for Sustainability (EfS)* or *Education for Sustainable Development (ESD)* are getting more attention (Chang et al. 2020, p. 1). This might be the result of, on the one hand, political efforts, especially by the United Nations (2015) and their formulation of "Sustainable Development Goals" (short: SDGs) and, on the other hand, the enormous efforts of social movements. Often these social movements grow from a common concern shared by several people into a global movement, like, for instance the Fridays for Future initiative. This means that we can already see some slight changes in the political agenda and efforts towards a sustainable approach, such as "The Green European Deal" by the European Commission (2019).

Similar to *digitization*, *sustainability* is a rather vague term: on the one hand, it describes the maintenance of good conditions for "environmental, economic and social well-being for current and future generations"; on the other hand, it focuses on ensuring the existence on our planet, which means not to "damage" or not to "be harmful to the environment" (Chang et al. 2020, p. 1).

Discussions that connect concerns of sustainability with findings of media (education) studies are rare although they have several things in common (e.g. Clausen et al. 2019; Umweltbundesamt Deutschland 2019; WBGU 2019). They both share a strong focus on research-oriented learning processes and, secondly, both discuss a remarkable change of social structures, for example relationships between teachers and learners in educational organizations. As an approach to take both developments into account, this chapter will discuss structural changes in educational organizations, with a special focus on social relationships and networks. It will point out what it takes to start a participatory approach in organizations and institutions that, consequently, considers both, aspects of sustainability as well as the effects of digitization on our society, on our economy and our ecological environment. In an approach like this, learners and teachers co-create visions of the future and take joint action to start initiatives which are both problem-solving and sustainable in order to handle the big challenges of a digital age during a crucial time in the fight against climate change.[2]

[2] This chapter was basically written in March 2020 during the world-wide crisis triggered by the pandemic of COVID-19. It is clear that this pandemic will have an enormous transformational impact on all organizations, including educational organizations. In many countries, schools are closed, and teaching in schools up to higher education suddenly had to take place in digital form. The restrictions on air traffic, mobility and manufacturing at a global scale may have a positive

This chapter focuses on the interrelatedness between digitization and efforts concerning a sustainable behaviour for a better future, especially in regard to climate change issues. In the first chapter, some theoretical concepts and empirical research results are explained. Furthermore, we discuss the peculiarity of digitization as well sustainability as so-called *wicked problems* and *crisis-like situations*. From this, we derive implications for transformational processes of educational organizations by becoming more *digital* and more *sustainable*. We finally conclude with some indications for further research in the fields of transformational processes of educational organizations, education for sustainability as well as education in consideration of digitization.

11.2 Sustainability in a Digital Age

Sustainability is a frequently used term, especially in recent years, triggered, for example, by the activities of the Friday for Future initiative and ongoing debates on climate change. From a political perspective, the effort of the United Nations (2015) concerning the SDGs sets an operational framework for further political decisions. Taking into account that the ongoing climate crisis asks for a fundamental change and therefore rapid actions, the European Commission (2019) formulated "The Green European Deal". In Austria, for example, environmental and climate protection plays an important role in the current policy of the Austrian Federal Government (Österreichische Bundesregierung 2020).

In its origin, the term *sustainability* comes from *to sustain* which means *to bear* or *to suffer* as well as *to keep up* (Harper 2001a). This explanation of the term's origin already points out the two poles of, on the one hand, striving not to destroy our planet and, on the other hand, trying to preserve the beauty and the balance of our natural habitat for future generations (Harper 2001b). Furthermore, sustainability always includes a social, economic and ecological perspective and their interconnections with each other. At the moment, we can detect a lot of effort concerning environmental and especially climate protection. As Jonathan Franzen (2020) puts it a bit cynically: Maybe we should not concentrate that much on climate protection as we have already lost this fight. He advocates focusing on the giant negative effects of climate change such as droughts and heat, famine, even more exploitation of human beings and our Planet Earth as well as a giant refugee crisis. According to him, all efforts of a so-called green new deal (e.g. Naomi Klein 2019) or a green deal, for instance, the one proposed by the European Commission (2019), are

effect on the fight against climate change. According to these assumptions, it is obvious that the pandemic of COVID-19 will have enormous implications on the topic of this chapter, as it addresses social and organizational transformations by digitization as well as a sustainable approach. However, at the current moment, the consequences of the whole crisis cannot be assessed and in the near future, there will certainly be a lot of research. However, this chapter is not going to include aspects concerning the pandemic as these would just be speculations.

useless and just wasted time and effort. From his perspective, we can see that a unidirectional focus on climate protection and climate change is problematic. As mentioned above, we always have to consider the three aspects of sustainability: ecological, economic and social aspects by regarding past, present and future developments.

Apart from the argument that we are fighting in an already lost "war," there is another challenge: The trend of "going green" has become popular as people take steps in order to help preserve the Earth for future generations. The development of neo-ecology also concerns ecological, economic as well as societal commitment. It changes markets slowly but noticeably, not only for companies but for consumers as well, as an increasing number of people want to consume in a fair and conscious way. For companies and institutions "going green" is necessary to stay attractive to customers. However, the label "green" does not necessarily mean that the company is really concerned about the environment and acts in an eco-friendly way, as real sustainability may not make business sense. Another example of a development that strives to combine the two aspects of digitization and sustainability is "Green IT," the practice of using computers and ICT resources in a more efficient and environmentally responsible way. Green IT is "a collection of strategic and tactical initiatives which either: (1) directly reduce the 'carbon footprint' of the organisation's computing operation; (2) use the services of IT to help reduce the organisation's overall carbon footprint; (3) incentivise and support greener behaviour by the organisation's employees, customers and suppliers; (4) ensure the sustainability of the resources used by IT" (Hird 2010, p. 16). Green IT could, for example, consider the reduction of the server performance at night or at weekends to reduce power consumption. Research has shown that algorithms, which adjust the performance of a wireless network according to utilization, could achieve an energy reduction of 15% on average (Umweltbundesamt Deutschland 2019, p. 19).

According to Schratz and Steiner-Löffler (1999), we need educational institutions in the digital age that are less concerned about learning issues (reproduction of knowledge) than about life issues (transformation of knowledge). Unfortunately, these questions are often regarded as an irritation rather than a challenge or as something that is not mentioned in the curriculum and therefore not covered at all.

"Going green" in the context of an educational institution could include using recycled paper or reducing the amount of paper used in the first place. At scientific conferences, for example, it has become popular not to print the programme and other print media for sustainability reasons. However, current discussions revolve around the world's digital carbon footprint, emphasizing the constantly increasing greenhouse gas emissions caused by the transmission of data via the internet and the consumption of electricity by using digital media. This is because the process of transmitting or streaming data requires millions of physical servers in data centres around the world, all spending a lot of energy. Concepts for a more sustainable use of information and communications technology (ICT) often recommend a *reduction* of something: we should reduce the amount of transmitted data, the power consumption, the consumption of streaming services such as Netflix or Spotify, the

numerous replacements of digital devices, etc. It is clear that these concepts depend on the social acceptance of an over-all reduction.

However, another example shows the ambivalence and enormous complexity of the topic: Digital technology can also be used *for* climate protection. Some extrapolations point out that ICT tools may even reduce CO2 emissions by up to 20% by the year 2030 (Clausen et al. 2019, p. 1). As one example, the block chain technology is being discussed as a possible means of reducing the emissions of CO2. Again, a lot of parameters need to be considered if you want to decide whether an ICT tool is *sustainable* or not. For instance video-conferencing tools are often referred to as a more sustainable alternative to business trips (especially when traveling by plane). However, research results have revealed that video-conferencing tools reduce business trips just at first sight. On second glance, it has to be taken into account that fewer business trips result in more free time for new projects and new invitations for meetings and, eventually, lead to new occasions for business trips and other forms of required energy (e.g. electricity, amounts of data saved on servers, paper) (Clausen et al. 2019).

Digital technology might also be a means of enhancing environmental und climate protection. On the one hand, digital technology is used for collecting climate relevant data from around the world. Consequently, digital technology is a main tool for understanding climate change and for monitoring its development (Umweltbundesamt Deutschland 2019, p. 49f). Or, as Chun (2015) puts it: Our idea of climate change is calculated and illustrated by algorithms. Computers collect data, put them in correlation and point out trends of climate change. But they are and always will be calculations and hypotheses and not a blueprint of reality (Chun 2015, p. 678f). On the other hand, digital media and digital visualizations help to make something abstract like climate, climate change and global developments visible and tangible for researchers and citizens. Therefore, we could say that digitization helps us to gather better and more information and awareness about climate change on a local and global scale. Consequently, we can rethink our behaviour and strive to live a more sustainable life (Umweltbundesamt Deutschland 2019, p. 50).

However, in contrast to all aspects mentioned above, we must not forget that *digital technology itself represents an ecological, economic and social challenge* at all stages in the life cycle of digital media: from technology development, the production process, from transport up to the use of digital media and their disposal and/or up- or recycling. In short, digital technology poses a problem for climate protection. In 2019, around 80% of people living in developed countries had a smartphone and used it almost every day. However, a large number of cell phones "can only communicate via networks based on 2G technology, which does not allow using the Internet" (The Shift Project 2019, p. 42). These cell phones are going to be replaced soon. And that is a lot of devices with a lot of energy used for their production and raw materials needed for developing, producing, using and disposing of them. Furthermore, "the number of smartphones will rise from 1.7 billion in 2013 to 5.8 billion in 2020, with a growth of 11% a year" (The Shift Project 2019, p. 34). These arguments concern both, the ecological and economic perspective, but we also have to consider the social perspective: Digital media, which are, for example, used in

western countries are produced in China, the raw materials are mostly mined in African countries, where people have to cope with exploitation, child labour and human trafficking. These are practical thoughts concerning the "real" world: this is the "blueprint of reality" mentioned above. We have to think about post- and neo-colonial exploitations (e.g. Castro Varela and Dhawan 2005; Thiébaud et al. 2018) by developed countries and eventually accept our responsibility.

According to this, we can see similarities when we consider the development of the internet: The internet was originally built as a power-free space with equal access for all users (Jörissen and Verständig 2017). However, nowadays, it is far from that. Large corporations like Google, Amazon or Alibaba have the power over the internet. Thinking of other countries from the global south, we have to take into account that internet access is a question of infrastructure like computer hardware, software and wireless network as well as a question of language as most of the information shared on the internet is in English, followed by Russian and German. Smaller languages and minorities have problems to be represented on the World Wide Web. Therefore, standards to represent these minorities are urgently required (Norbert Klein 2018). Still, we can see a huge social gap offline as well as online.

As mentioned above, Jonathan Franzen (2020) emphasizes that we should not focus on climate protection that much, as we have lost this war already. Therefore, Jesse Ribot suggests focusing much more on "climate-related crises":

> "I am definitely not writing about the causes of climate change. I am not writing about smokestacks or drivers in New Jersey or Beijing or anything like that. Rather, I mean the causes of the crises themselves. The causes of hunger, famine, dislocation, economic loss; that is, the outcomes that happen when climate trends or events hit the ground." (Ribot 2019, p. 34)

As Ribot points out, these climate-related challenges affect "vulnerability," which is closely related to crises, because "without vulnerability there is no crisis [and …] vulnerability here is the predisposition, in some way or another, to damage". When vulnerability comes together with hazard and with specific moments like a climate situation, it can easily turn into a social crisis. But: "[…] climate-related crises therefore do not merely fall from the sky when there is a climate event. They are socially produced via conditions on the ground" (Ribot 2019, p. 34).

As sustainability is a far-reaching concept, so is digitization. However, the social transformation triggered by digitization is not only a "more of something." For example digital technology in everyday life does not only mean reading and writing with the help of digital media. It is a transformation which is changing social structures. Furthermore, digital technology is not only black and white. According to Kerres (2018), it should not be regarded additively, as an additional aspect to our lives but as an integral part. Taking matters a step further, as digital technology makes up an integral part of our lives, thinking and behaving in a "sustainable" and environmentally responsible way should be integral, too. Both, building holistic structures to cope with digital technology *and* behaving sustainably in organizations such as schools and other educational institutions, ask for a fundamental transformation process. Society expects citizens to be able to deal with change

constructively, both privately and in the dynamic context of global, multicultural change. According to Fullan, educational organizations are the only social institutions that have the potential to make a significant contribution to this goal (Fullan 1999). However, a transformational process like that leads to questioning well-known, traditional structures and values. Apart from that, speaking of fundamental changes, we often use the term "crises".

11.3 About Crises and Wicked Problems

One peculiarity of digitization as well sustainability is that they are difficult to define and are often regarded in the context of crisis-like situations. As a modern society, we currently seem to face a lot of *crises*. But crises are not necessarily negative. They are *conditio sine qua non* and *stimuli sui generis* of learning processes and of pedagogy as a research discipline (Schneider-Taylor 2009, p. 104). The etymological origin of the word *crisis* reaches back to the sixteenth century. The Greek word *krísís* literally means separation or decision. A crisis certainly is a kind of turning point (Kluge 2011, Abschn. Krise; Schneider-Taylor 2009, p. 109f). As Koselleck (1973, p. 141) points out, the word crisis was first commonly used in medicine as a decision point between life and death. Therefore, a crisis is often related to the fear of death. In addition to that, the word crisis is closely related to the word *criticism*, which asks for proof and valuation of an issue and can thus be the starting point of a crisis (O'Mahony 2014, S. 250; Pfeifer 1989, p. 934f).

As mentioned above, in order to overcome a crisis, traditional structures are being questioned. Additionally, as part of the crisis, socially accepted systems of norms and values have to change as well. After a while, step by step, a new system of structures and a new system of norms and values will be constructed. Another important issue is that with the developments of digitization *and* climate change, we do not only face crises, but so-called *wicked problems*, with challenges which reflect the structural interrelatedness of media, digitization, economy, mankind, ecology and habitat. As stated above, wicked problems cannot "be clearly defined with proposed and testable possible solutions". They have no "definitive formulation," "there is no way of determining when a solution has been found; solutions are not true or false but rather good or bad" and "there is no immediate or ultimate test of a solution because any possible solution modifies and changes the problem". Therefore, wicked problems cannot be solved. The aim must be to understand a wicked problem more and more, to raise awareness and "to learn how to live with it" (Peters 2018, p. 429).

When talking about sustainability and climate change, the term "wicked problem" is commonly used (e.g. Peters 2018). Considering the discourse of digitization, this is, however, not the case. This may seem strange as the speed of the digital development makes it simply impossible to keep up with concepts about possible implications digital technology may have on humans, animals and our Planet Earth, in general. When considering both aspects, we could even speak of "wicked and

interwoven challenges." These challenges have in common that the conditions and many things around them are constantly changing, while people are struggling to solve them. This has various consequences, for instance consequences for social structures: First of all, we have to accept the fact that we do not know and are not able to anticipate how things might develop. Therefore, some projects are open-ended, which means that we may find answers at all levels which will then just lead to even more questions than before. However, crisis-like situations can also be regarded as opportunities for structural changes, for example changes in power structures, and for a more collaborative process of research. It is obvious that this approach cannot follow just one perspective. It clearly requires a holistic, interdisciplinary approach. In addition to that, it has to consider future changes in the short and long run. And, at the same time, it is obvious that this might somehow seem uncomfortable and awkward as uncertainty usually implicates fear and frustration.

11.4 Transformations of Educational Organizations?

How will these "wicked and interwoven challenges" mentioned before transform whole organizations, especially schools and other educational institutions? As stated above, neo-ecology is a trend that will shape the 2020s, as environmental awareness is something companies as well as consumers simply cannot ignore any more. Buzzwords and phrases like energy efficiency, clean energy, greenwashing, "going green," "Green your product!" are widely used and environmental awareness has become a social movement. As we know, this could be a political or marketing strategy and/or real engagement for climate and environmental protection. In addition to that, we also know that "going green" mainly focuses on ecological aspects and does not primarily consider equal rights and social fairness on a local and global scale. The economic perspective is still the predominant one in our neo-liberal world as it is getting more and more detached from social and ecological aspects. However, as previously mentioned, the consistent reference of ecology, economy and social justice and the relationship among them is urgently necessary, not only in the discourse of digitization.

In the previous chapters, we have already discussed some political initiatives concerning digitization *and* sustainability. Another example is the DigComp – Concept of the European Commission, which provides a framework for major skills that are important in a digitalized world. This framework is often used as a basis for developing educational programmes. It contains one paragraph saying "4.4 Protecting the environment. To be aware of the environmental impact on digital technologies and their use." (Carretero et al. 2017, p. 17) Furthermore, the German strategy of the Standing Conference of the Ministers of Education and Cultural Affairs (KMK) called "Education in the Digital World" claims to protect nature and the environment ("4.4. Natur und Umwelt schützen") (Deutsche Kultusministerkonferenz 2016). In Austria, a new curriculum was developed and put into practice in 2018 for a new school subject called "Basic Digital Education"

(Digitale Grundbildung) in secondary schools, which can either be taught as an individual subject or be integrated in various already existing subjects. In accordance with this new curriculum, children learn about the dynamics and meaning of values, norms and different interests with regard to the use of digital media in various contexts (economic, religious, political, cultural). Furthermore, they are supposed to know to what extent the use of digital technologies damages the environment or contributes to environmental protection (Bundesgesetzblatt für die Republik Österreich 2018). This means, the ecological aspect is mentioned, if only in one point.

To sum up, we can at least see some effort of awareness raising towards ecological aspects in the educational agenda. In addition to that, the efforts of institutions like the German "Wissenschaftlicher Beirat für Globale Umweltveränderungen" (WBGU 2018, 2019) and more or less private institutions like the "Rat für digitale Ökologie" (https://ratfuerdigitaleoekologie.org/) have to be mentioned. The global perspective is taken into consideration, for example, by the United Nation's (2015) formulation of the SDGs: The SDG 9 targets to "build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation." The subgoal (9.c) aims to "significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020." As a first result, the UN postulated for 2019 "almost all people around the world now live within range of a mobile-cellular network signal, with 90 per cent living within range of a 3G-quality or higher network […]" (United Nations 2015). However, this can be interpreted differently as well: The formulation of the SDG 9 may be (ab)used by ICT companies from western countries to create new jobs to install their infrastructure to the global South without taking heterogeneous cultures, natural environments and social structures into consideration at all. It is obvious that bringing ICT to "least developed countries" is not a good thing per se but has to follow participative processes by regarding the specific conditions of these countries.

After having considered educational policies and the political effort, the question arises what all that means for educational organizations? From our point of view, the social structures of schools as well as of other educational institutions have to change according to "wicked problems," which cannot be solved and cause discomfort as well as uncertainty in regard to future developments. One important aspect is that the traditional relationship between teachers and students changes as hierarchies are generally levelled down. A lot of local initiatives have emerged, which influence general structures from bottom up. Another important point is that, especially in educational organizations, learners (e.g. pupils and students) as well as teachers can put governing bodies under pressure and thus convince them to take action. We can also see a lot of citizen projects, which first started out locally and then grew into bigger or even global movements such as the Fridays for Future initiative. Fridays for Future has managed to put pressure on educational policy makers to allow the participation on the Fridays for Future demonstrations and to pay more attention to environmental and climate protection in general. All these initiatives have something in common: They have very flat hierarchies. One possible

reason for that could be, that all citizens have to act and think like researchers to solve or to better understand a certain "wicked problem." As there is not the *one* right answer or the *one* approach to find a solution, we all are unknowing but at least trying and learning and are hopefully doing research.

In the context of flat hierarchies, teachers become more like coaches who support learners in individualized learning scenarios. In this special learning environment, subjects, time and space disperse and new paths for cross-curricular learning open up. Learning is no longer confined to the classroom but takes place in companies, on excursions, in museums or exhibitions. The learning time is no longer rigorously squeezed into a 45- or 50-min. cycle, because cross-curricular projects allow students to work on their topic for a longer time and take their own breaks sensibly.

Apart from that, a "wicked situation" like the ones mentioned above requires new forms of research for new solutions in a collaborative and interdisciplinary way. We need to use all our knowledge, imagination, creativity and technology to strive to solve the big challenges of our society. Thus, schools and other educational institutions should allow employees and learners to come together. They should grant them time and space to think about current issues critically and creatively. As a consequence, so-called communities of practice can emerge that share a concern or passion for something they do and, as they interact regularly, they learn how to do it even better and more effectively (Wenger 1998). Professional practice is based on the capacity to reflect on things as one step in the circle of continuous learning. Teachers are experts in many fields like the development of innovative learning designs or the integration of ICT in class. Much of this knowledge, however, is implicit. To share, discuss and reflect on this tacit knowledge with others, teachers often need support to make their competencies visible to themselves and others. In communities of practice, often supported by the supervision and counseling of a university or college, teachers become aware of their competencies and can thus learn and profit from each other's experience-based knowledge.

In this context, *learning* means learning how to understand the complex developments of our present and future society and trying to find solutions. This approach is not new, as it was already used by the educationalist Wolfgang Klafki (2007). Klafki wrote a didactic concept that describes ways to cope with so-called archetypal, revolutionary key issues ('epochaltypischen Schlüsselproblemen'). According to him, learning does not aim at developing a verifiable growth of competencies. Consequently, this understanding of learning processes requires open curricula and alternative forms of assessments. In addition to that, this approach is very practice-oriented: After having found a possible solution to a complex problem, this knowledge must be put into action. Without action, the best solution is redundant. But, again, these processes should not happen within a traditional hierarchical structure. All participants of an educational organization – schools and other educational institutions can be regarded as learning organizations in this context – should have the possibility to co-create the organization with the board committees as well as to co-create visions of possible problem-solving strategies and a sustainable future.

Another aspect, which is being discussed in several approaches of "global citizenship education", "service learning" or "civic education" (Schlicht and

Slepcevic-Zach 2016; Sporer and Bremer 2016, p. 356), is a multiple perspectives approach. It is important for educational institutions to start projects cooperating with non-educational partners in order to get a wider perspective and see the big picture. On the one hand, this can be accomplished on a local scale: Local institutions and communities often have needs in specific areas, which may be solved or at least worked on by teachers and learners in cooperation with the local groups. On the other hand, schools profit a lot from external experts who produce new ideas and can enhance the collective understanding of various issues. On a global scale, cooperation or networking with other people, maybe even from different continents, can initiate discussions, raise attention for social inequality and can thus promote tolerance and problem-solving skills.

To sum up, being aware of the transformational power of digital technology, on the one hand, and, on the other hand, of the necessity to cope with environmental and climate protection by acting in a sustainable and environmentally responsible way at all levels – ecologically, economically and socially – can be a trigger for fundamental transformational changes of educational organizations. These changes concern traditional educational structures as teacher-student relationships, time, space as well as the curricula and teaching and learning processes. Becoming aware of these "wicked problems" may consequently also have an impact on individual people and other (learning) organizations on a local and global scale and – in the long run – on national and international political agendas as well.

11.5 Conclusion

In this chapter, we discussed the significance of digitization for climate change as well as a possible means against the further destruction of the environment. Digitization and the idea of sustainability have in common that they can both be seen as "wicked problems" and crisis situations. Thus, both can also be regarded as opportunities and triggers for a necessary transformation of learning organizations to be prepared for future times and for main challenges we, as a society, have to face.

Without any doubt, digitization represents a comprehensive challenge for today's society. And without a doubt, environmental and climate protection is a very complex issue on a national and international level this century and beyond. But, instead of discussing and meeting these challenges separately, we should deal with them in an interdisciplinary approach, which allows people and institutions to undergo a transformational process that enables them to live and act according to the premises of sustainability. In this context, sustainability has to be understood within the triad of ecological, economic and social aspects. On behalf of this mindset, educational organizations are required to rethink their traditional social structures, economic outcomes and ecological behaviour. As this chapter has shown, sustainability and environmental responsibility include extensive transformational changes in educational organizations and transformational learning processes of all the people involved. Institutions and their people have to think out of the box: Digitization and

sustainability are targeting a global perspective, and educational organizations therefore need to open up, reconsider traditional structures and values and include local and global perspectives as well. After all, thinking out of the box may be the one way to face the discussed grand challenges of our society.

In the future, more research has to be carried out in the context of digitization and protecting our environment and climate, in the context of digitization and Education for Sustainability (EfS) as well as digitization and transformations of learning organizations with a specific focus on sustainability. It is obvious that the challenges in the research fields mentioned above can only be met by inter- and transdisciplinary research methodologies.

Acknowledgements The research results discussed in this chapter are based on the project OEHA (oeha.phwien.ac.at), funded by the "Innovationsstiftung für Bildung" and the "Austrian agency for international mobility and cooperation in education, science, research and culture" (OeAD) from September 2019 to August 2020.

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Chapter 12
Competencies, Culture, and Change: A Model for Digital Transformation in K-12 Educational Contexts

Angela Elkordy and Jessica Iovinelli

12.1 Introduction

The process of change in learning organizations can seem unpredictable or random. Great ideas can inexplicably languish during implementation, whereas ineffective practices or misconceptions can spread and take hold within hours. A systems perspective to organizational change can shed light on the seemingly disconnected processes and outcomes of change, as well as an understanding of change versus *transformation*. As K-12 organizations increasingly adopt digital tools and technologies for communications, knowledge creation and management, as well as *learning*, the knowledge of concepts such as innovation diffusion, technology adoption models, and change management can help leaders to plan for success. The learning sciences – an interdisciplinary field grounded in findings from the cognitive sciences, social psychology, neuroscience, and educational psychology – can shed light on the human elements of change within systems and the *why* of processes. The science of learning is a translational science; findings from more traditional research are not easily applied in naturalistic settings to inform instructional practices, nor provide insights to organizational culture. It is crucial, however, to understand the impact of complex, interconnecting systems in learning organizations to distinguish between managing *change* and leading *transformation.* The learning sciences function as a bridge, so to speak, between research and its implication to practice in different contexts.

Understanding the principles behind strategic leadership that are necessary to effect change in learning organizations is critical to enact new initiatives or widespread transformation successfully. For example, there is a significant body of literature describing the *importance* of social or the human elements of change in learning organizations, including aspects of culture, community, and context. A

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_12

learning sciences-informed view, however, can illuminate the *why* or the essential principles of social and communications systems crucial for success. This scenario is analogous to *knowing* that conversations are necessary versus an *understanding* of the kinds of interactions and communications needed, for whom as well as when to move change forward in a productive manner. Furthermore, an understanding of effective principles – as well as strategies – necessary for transformation allows for greater insight when troubleshooting problems as they arise.

Despite the importance of learning in learning organizations, models of change do not look deeply into these important components, nor carefully examine the interactions within the system functioning as *forces*. Existing models of technology adoption, such as the diffusion of innovation (DOI) (Rogers 1995) or the Technology, Organization and Environment (TOE) model (Tornatzky and Fleischer 1990), focus upon a high-level systems view of the components and processes of change. For example, the TOE framework views the overall system as a collection of three subsystems of context – the technological, organizational, and environmental contexts. In a review of the literature on technology adoption models, scholars Oliveira and Martins (2011) described several variants of the DOI and TOE models.

The successful infusion of appropriate instructional technologies in K-12 contexts requires strategic planning and significant leadership support. Until recently, however, K-12 leadership behaviors and decisions, particularly creating and sharing a vision, setting instructional goals or expectations, and organizational culture, has mostly been ignored as contributing factors in the degree of success in building or district technology implementation. As a result, the interactions between building leaders and school staff have not been studied significantly as influencing the diffusion and subsequent adoption of instructional technologies throughout a building. The International Society for Technology in Education (ISTE), an international educational technology organization, contributed to the work of understanding the leadership supports necessary for transformation. In its 2018 refresh of standards for education leaders, ISTE includes criteria such as *Visionary Planner* and *Systems Designer* in recognition of the complexity of the leadership supports required for disruptive, transformative change (ISTE 2018).

In this chapter, we discuss digital transformation and second-order change from a learning science-informed perspective. For example, educational leaders in K-12 and higher education contexts are encouraged to communicate extensively with stakeholders in preparation for new initiatives or changes. Usually, the reasoning behind leader communications is primarily to inform – that is, to convey the rationale, intent, and timeline for the changes. In general, the role of communications as influential and iterative, interconnected events is underestimated and, as a result, is neither adequately considered nor leveraged. Information from the learning sciences, however, can share a more nuanced understanding of the principles at work in effective communications, for example, the necessity for conveying and converging stakeholders' mental models, that is, individuals' understanding of concepts and their interconnections. A fundamental mistake is assuming that team members hold similar conceptualizations of ideas in a community context, such as K-12 learning organizations. It is also important to understand the role and impact of participants'

emotions, learning, and work-related needs as well as power relationships and interactions. We present a case study that identifies positive steps toward digital transformation in schools and implications for the work to come.

12.1.1 Digital Transformation and Second-Order Change

In an organizational context, the process of change relies upon many external factors, including methods, tools, and systems. First-order change may include revised processes and products. It relies upon existing knowledge and skills to effect, is consistent with "prevailing norms and values," and occurs within the parameters of familiar paradigms (Waters and Marzano 2006, p. 18). Although schools and organizations have been using technology to manage information for years, the focus now is less on data collection and organization itself, and more on data usage to further strategic goals and targets as well as for instruction. This focus requires a shift in mindset throughout organizational systems to realize the potential of technology for everyday organizational needs such as teaching and learning, communicating, data acquisition, storage, and processing. In K-12 educational contexts, leaders must first experience this shift in perspective to successfully guide other stakeholders.

For transformation to occur, however, requires second-order change that involves the organization as a whole, a system of systems. "Any digital transformation initiative will only succeed if there is a holistic approach to standardize the way that information and content is managed, used, and shared across the organization" (OnBase 2017, p. 2). Importantly, *transformation* in an educational setting also requires the use of digital tools to be leveraged as cognitive tools to scaffold, assess, and facilitate learning and knowledge generation. Digital transformation entails *disruption* – significant change at a fundamental level – resulting in a paradigm shift with regard to conceptualization and reorganization of mental models or shared understanding. Critical to this process of disruption and rebuilding is thinking about how the unique affordances of digital technologies can be leveraged to meet newly envisioned strategic goals and objectives. We propose an updated model of change for digital transformation. In particular, digital transformation should be considered within existing frameworks in the areas of *organizational context, learning, leadership, and people and culture,* which we discuss next in a brief review of the literature.

12.2 Literature Review

In this section, we consider three intersecting areas for the strategic planning and implementation of a wide-scale, disruptive change in educational settings: organizational context, leadership, and people.

12.2.1 Organizational Context

When analyzing factors necessary for digital transformation, organizational context is paramount to determining behavioral barriers to such large-scale systemic change and tailoring design and implementation accordingly. Context, as defined by Wagner, would be the larger organizational systems, the reality of the community, and its history that create the current state of the organization (Wagner et al. 2006). To create the right conditions or the "external architecture surrounding student learning, the tangible arrangements of time, space, and resources" (Wagner et al. 2006, p. 101) imperative for implementing large-scale transformation, context is critical for each initiative to be successful and sustainable.

The Technology-Organization-Environment (TOE) framework (2012) describes technological, organizational, and environmental contexts as three different elements of a firm's "context influence adoption" (Baker, p. 232). In this model, developed in 1990 by Tornatzky and Fleischer, organizational context is described as "the characteristics and resources of the firm, including linking structures between employees, intra-firm communication processes, firm size, and the amount of slack resources" (Baker 2012, p. 233). In their research, Tornatzky and Fleischer categorized organizational context into formal and informal linking structures, communication processes, size, and slack. They found benefits of both an organic and decentralized organizational structure as well as a mechanical structure in regard to adoption and implementation of innovation. Decentralized organizations rely on teams, fluidity, and flexibility in groupings of employees, and promotion of communication, which leads to the adoption of innovation. At the same time, mechanistic structures provide the strategy necessary for implementation (Baker 2012). The key was knowing the organizational context to leverage it for optimal transformation.

Knowledge of the organizational context was also identified as highly relevant in a study authored by Evans et al. (2017) on integrated care initiatives and transformation. The researchers found that "organizational contexts are rarely described, understood, or measured with sufficient depth and breadth in empirical studies or in practice" (p. 1). Through their study, they set out to prove that tailoring programs to respond to the local and organizational contexts impacted their degree of success. Semi-structured interviews and a multitude of surveys were used to create, revise, and validate a conceptual framework called the *Context and Capabilities for Integrative Care (CCIC)* framework for the study of organizational context in integrated care delivery situations. The final framework consisted of 18 organizational factors that could be sorted into three broad categories: basic structures, people and values, and key processes. The CCIC framework can "help inform our understanding of the dynamic interactions and evolution of organizational context factors" by providing a standardized method to compare multiple initiatives. Furthermore, the framework "can enhance our understanding of the influence of these factors, support the transfer of best practices, and help explain why some integrated care initiatives succeed and some fail" (Evans et al. 2017, p. 12).

Fonseca and Domingues (2017) in describing key actions for digital age contexts suggest to

> monitor the organizational (internal and external) context and identify the key issues that affect the organization's ability to deliver quality products and satisfy their customers and key stakeholders, and to plan, design, implement and control change in an effective and timely manner. (p. 443)

They define organizational context as "a pattern of shared values and assumptions within an organization which enables this to operate" (p. 445). They concluded that in a dynamic area such as digital transformation, where technology is continually updating and evolving, organizations could risk "losing the competitive edge to more agile and innovative competitors" (p. 446). Furthermore, Fonesca and Domingues state that a lack of understanding of the organizational context could easily prevent the company from making systemic changes. An online survey was sent to over 5,000 auditors through which quantitative data were collected during the study, then analyzed, finding a positive correlation between "the capability to understand the context and both the ability to change and the achievement of improved performance and results" (p. 453).

12.2.2 Leadership

In the last decade, the concept of leadership has significantly changed. There has been a broadening of the scope of technology-related knowledge in a K-12 organizational or school setting. The challenges have moved away from simply acquiring devices, configuring infrastructure, and a basic level of operational skill to challenges of aligning the implementation to goals, increasing staff capacity, and shaping a supportive culture. These shifts have brought to light the lack of informed leadership (Flanagan and Jacobsen 2003; Ritchie 1996) and the need for leadership to accept the challenge of creating the conditions in which employees and staff are empowered to experiment and take risks with technology (Iovinelli 2020, p. 38).

Many nationally recognized organizations have connected the importance of leadership in digital transformation. Because of change in current teaching and learning environments, the International Society for Technology in Education (ISTE) has created sets of standards for students, educators, education leaders, coaches, and computer science educators. These standards, regularly revised, "act as a roadmap for bold, innovative educators and education leaders to re-engineer their schools and classrooms for digital age learning no matter where they fall on the journey to meaningful, effective ed. tech integration" (ISTE 2018, para. 3).

Initially titled *Standards for Administrators* in 2002, the ISTE *Standards for Education Leaders* were created to promote the effective integration of technology into the curriculum. ISTE realized the importance of personal learning communities (PLCs) and shared leadership, which was reflected in title change as a way to reflect the movement from top-down management to developing leaders, regardless of

title, who leverage technology to build a favorable learning landscape (ISTE 2018; Iovinelli 2020). The latest refresh of the standards in 2018, now called *Standards for Education Leaders*, has become more targeted. Specifically, the guidelines identify the "knowledge and behaviors required for leaders to empower teachers and make student learning possible" (ISTE 2018, para. 1). The standards highlight public areas of struggle and the leadership skills necessary in education today. A key focus is how leaders can demonstrate technology is essential to support digital age learning as a(n): equity and citizenship advocate, visionary planner, empowering leader, systems designer, and connected learner (ISTE 2018).

On a more general level, LearningForward (2011) created standards for professional learning pertaining to the ability for leaders to "develop their own and other's capacity to learn and lead professional learning, advocate for it, provide support systems, and distribute leadership and responsibility for its effectiveness and results" (para. 1). Through research and evidence-based practice, a Professional Learning framework was created that includes learning communities, leadership, resources, data, learning designs, implementation, and outcomes to provide progress toward a goal. The leadership component of the framework focuses on developing a capacity for learning and leading, advocating for professional learning, and creating support systems and structures, all of which are needed to turn leaders into agents of change for digital transformation (LearningForward 2011).

12.2.3 People

The quality and success of learning, leadership, and change processes hinge upon the stakeholders – the people involved. Understanding the interactions and impact of people within systems necessitates an insightful awareness of organizations' culture as defined by Wagner et al. (2006) as the "shared values, beliefs, assumptions, expectations, and behaviors related to student learning, teachers and learning, instructional leadership, and the quality of relationships within and beyond the school" (p. 102). Evans et al. (2017) focused upon integrated care initiatives and transformation in a study. The authors defined a framework of factors that could impact the success of an initiative, which also cited *people and values* with a focus on patient-centeredness and engagement, commitment to learning, and readiness for change.

The challenge of digital transformation has moved away from merely acquiring devices, infrastructure, and a basic level of operational skill to aligning implementation to school or organizational goals, expanding staff capacity, and shaping a supportive culture. If the countless attempts at systemic reform have taught us anything, it is that "policy change without cultural change is an exercise in futility and frustration" (Reeves 2009, p. 37). A person's background, culture, values, and traditions affect the way they work, learn, and respond, which makes human systems unpredictable and dynamic. Digital transformation has implications for all social systems involved, namely the need to increase capacity in preparation programs, but also in

the workplace. The ISTE Standards for Educators, Coaches, and Students (2018) highlight a system that embraces shared learning, trust, and empowerment while focusing on expanding the capacity of each stakeholder group. These standards, though intended for educators, apply to the overall concept of rethinking the usage of technology in learning organizations and people involved, an area often neglected in systemic change.

12.3 Implementing the Model: A Case Study

An empirical study of digital transformation in schools was completed in Modern Mind Community Unit School District (CUSD). The field of educational technology lends itself to both quantitative and qualitative research as both methods have the potential to create new, actionable insights for improving technology usage for student learning (Patton 2008). Through discussions with the intended users of this study, the decision was made to ensure a comprehensive evaluation by balancing the limitations of one data type with the strengths of another**,** which involved using both qualitative and quantitative methods (Fig. 12.1).

The data collected centered around two areas of research concerning technology implementation and digital transformation in K-12 learning organizations: professional development and leadership. A survey was conducted to collect data on educator perceptions about the effectiveness of the multiple formats of professional development offered throughout the year. Questions included participants' opinions about the learning experiences' impact on technology implementation, as well as

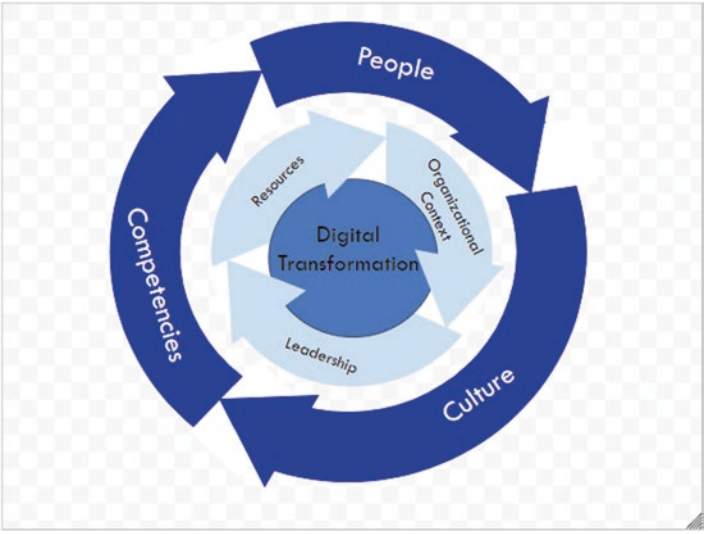

Fig. 12.1 The proposed model of digital transformation

ideas or suggestions for additional professional development formats and leadership supports. The questions were modeled after a core set of features for professional development defined by Desimone (2009), Garet et al. (2010), and Penuel et al. (2011) while also reflecting the *Standards for Professional Learning* framework created by LearningForward (2011). In conjunction with the professional development survey, staff interviews provided additional data regarding the perceived role of technology in education and the level of success of implementation in Modern Mind CUSD. To describe and quantify leadership behaviors and gather administrative perceptions of their influence, data from the 2018 and 2019 *BrightBytes* surveys and public data from the 2017 and 2019 *5Essentials* survey were analyzed, along with interviews of administrators. Questions were structured using the newly revamped 2018 ISTE *Standards for Education Leaders* (formerly known as the ISTE Standards for Administrators) as a framework.

Classroom observations also took place to triangulate perceptions with in-class practices in the areas of professional development and leadership. Correlational analyses using the observation data determined the relationships between total score, years of experience, and participation in professional development formats to examine how one or more of these variables may change with others. Along with the correlations, cluster analyses identified groups of similar participants based upon the variables and data collected. The purpose of these analyses was to use further quantify progress toward digital transformation and to aid in prioritizing recommendations to continue to move forward (Patton 2008).

12.3.1 Stuck in the Analog

Modern Mind CUSD is a district of five schools with a total of just under 3,000 students in grades pre-kindergarten through 12. In addition to the district office, there is one early childhood center (ECC), two elementary schools (Innovate and Integrate Elementary), one middle school (Interact Middle), and one high school (Modern Mind High School). These schools serve the residents of Mente, a near west suburb of a large Midwestern city with a population of approximately 24,000. Mente has a large Italian population and has recently seen an influx of Polish, Ukrainian, and Mexican immigrants. Mainly residential, it is known for not only its welcoming family feel but also its high taxes.

The use of digital tools and technologies was not a large part of the culture or practice of Modern Mind CUSD before 2016. The extent of technology available to students in each of the five buildings was limited to a few computer labs, a library lab, and a few laptops per classroom at the primary grade levels. The articulated vision of the district for the use of these resources was vague and almost nonexistent. In the prior 20 years, there were only three significant school-wide initiatives: a math lab for the elementary schools, a new science wing at the high school, and a reading initiative involving the book *Three Cups of Tea* by author Mortenson & Relin (2007). Also, in those 20 years, leadership turnover was high, with five

superintendents total, three of whom served in the last decade. The instability in leadership contributed to a belief in the community and among staff that any project or initiative would not be followed-through nor adequately funded as part of a larger picture or vision. As Modern Mind approached the 2016–2017 school year, significant decisions were necessary for the continued growth of the district. The school leadership, including its board and superintendent, determined several areas for substantial growth in the following school year. These areas included: technology services and tools, curriculum articulation and opportunities, student support services, maintenance and improvement of facilities, district operations, and community outreach.

Former high school assistant principal, Dr. James Namow, was promoted to assistant superintendent in 2016 and was involved heavily in the revision of the goals to address the needs identified. Also, in cooperation with the resting school board of education, Dr. Namow helped create a new vision to "inspire minds in the pursuit of excellence" supported by the collaborative mission to cultivate "individualized social-emotional learning processes, rigorous academics fostering inquisitive minds prepared for critical thinking, active, engaged partnerships with the community and parents, and innovative uses of 21st-century technologies for teaching and learning" (omitted for confidentiality 2019, para. 2). Dr. Namow hired a Director for Instructional Technology, Ms. Angela White, and the two administrators were tasked with the majority of the strategic planning for the roll-out of a districtwide technology initiative that would serve as the foundation for the other identified areas of growth. They both knew that in order to move toward digital transformation in the district, the focus had to be overarching goals for technology implementation as a way to improve student achievement and academic growth, enhance the curriculum, and create an environment that supports differentiated and personalized learning. To accomplish these goals, Dr. Namow and Ms. White focused upon the first layer of elements necessary for digital transformation – the organizational context of Modern Mind, that is, the role of leadership, and the resources both available and desired. These elements would be essential to support the people, increase competencies and expand capacity, and to create the culture conducive to systemic change and digital transformation. This approach was necessary in order to move the needle for learning and to avoid the common pitfall of continuing to teach in the same manner as before, that is, first-order change, hoping that technology alone will magically make it more meaningful and effective.

12.3.2 Elements of Organizational Context as a Barrier

The context of Modern Mind CUSD, as defined by Wagner, would be the larger organizational systems, the reality of the community, and its history – all of which create the current state of Modern Mind CUSD (Wagner et al. 2006). Knowing the staff and the school or district context is imperative when implementing large-scale transformation and to create the right conditions or the "external architecture

surrounding student learning, the tangible arrangements of time, space, and resources" (Wagner et al. 2006, p. 101). A deep understanding of the context is critical for an initiative to be successful and sustainable. The district must provide the support necessary to continue to alter pedagogy to prepare learners to be active, creative, knowledgeable, and ethical participants in our global society (U.S. Department of Education 2017). Modern Mind CUSD is a PreK-12 district composed of five schools, 19 administrators, and 215 staff members. The longevity of the staff service is in stark contrast with the high turnover rate for administrators, especially in recent years, making stability a challenge for leadership and staff at all levels. The historical recount of administrative turnover has led to a lack of grounded relationships, causing a trust gap. Similar to an achievement gap, a trust gap takes time and strategy to eradicate, as it is a complex force that is essential and invisible. Continuous, job-embedded professional development opportunities were plentiful, allowing for meaningful learning that was mindful of the value of teachers' time, and that allowed for personalization of learning for adults. An essential element was missing, however – the movement from top-down management to a practice of developing leaders, regardless of title, who could leverage technology to build a positive learning landscape and realize the possibilities of a digital transformation.

12.3.3 Building Leadership Able to Create and Sustain the Change

Dr. Namow and Ms. White were aware of the importance that "education leaders [have] personal experience with learning technologies, an understanding of how to deploy these resources effectively, and a community-wide vision for how technology can improve learning" (U.S. Department of Education 2017, p. 42). In contrast to a focus solely on practical responsibilities and management of the status quo, leaders need to become agents of change, capable of driving shifts in instructional paradigms, as well as changes in culture. The International Society for Technology in Education (ISTE) Standards for Education Leaders highlight the need for educational leaders who are working to attain authentic digital transformation to demonstrate technology usage to support digital age learning in several ways. The guidelines require educational leaders to advocate for equity and citizenship, as well as being visionary planners, empowering leaders, systems designers, and connected learners (ISTE 2018).

In the study, one measure used to analyze leadership factors was the *5Essentials* survey. Created by the Illinois State Board of Education (ISBE), this survey identifies five indicators that lead to improved outcomes for all students, as measured by improved attendance and substantial test score gains. These indicators include effective leaders, collaborative teachers, involved families, supportive environments, and ambitions instruction. The *BrightBytes* survey is another form of data used. It is collected by a company that provides data collection for technology integration, using research-based data analysis to understand better the impact that technology is having on student learning in schools (BrightBytes 2019). Modern Mind CUSD uses the Teaching and Learning module, which focuses on the Council for Advancement and

Support of Education (CASE) framework of classroom, access, skills, and environment to make data-driven decisions. Through synthesizing data collected from the *5Essentials* 2017 and 2019 data, the *BrightBytes* 2018 and 2019 survey data, and perception surveys, the study had several findings. One of the results is that the Modern Mind community operated under the belief that their school leaders lack the capacity for instructional leadership, particularly in providing useful feedback and support. Analysis of the survey data revealed the perceptions that leadership should be a resource, maintain communication, provide differentiated support, and create a culture of learners. Leadership's ability to set specific goals to help prioritize a focus, to set targets for learning, and to create accountability did not meet respondents' needs. Through the evaluation process, Dr. Namow and Ms. White found that only one of the six administrators cited a specific goal to increase personal technology capacity, and only one administrator having a school-wide goal in technology. However, even these goals lacked specificity. Instructional leadership is a critical aspect of school leadership, where measurable goals or objectives must be in place, not only for technology implementation but also for overall school improvement. The National Education Technology Plan synthesized the most recent available research on future-ready leadership and identified "four key focus areas of effective leadership: collaborative leadership, personalized student learning, robust infrastructure, and personalized professional learning" (U.S. Department of Education 2017, p. 43). School leaders without these characteristics, a basic knowledge of technology, an understanding of the power it has to transform learning, and the ability to articulate a vision for how technology can support learning goals will ultimately become yet another barrier to successful technology integration.

12.3.4 Using Resources to Begin Moving Forward

Dr. Namow and Ms. White worked hard to ensure that resources to support the shift to digital transformation were abundant and available to all staff, with the majority of the effort placed upon certified teaching staff and administration. Professional development was designed and facilitated by Ms. White and included half- and full-day sessions, teacher coaching, online self-guided instruction, cohort studies, coordinated site visits, and conferences, seminars, certifications, and degree program opportunities. Title I funding was used to provide funding for substitute teachers, and the staff was allowed to opt into as little or as much professional development as they deemed necessary for their professional practice. An influential district technology committee was in place that actively surveyed the needs of staff and students. The committee guided professional development topics and schedules, piloting tools and programs for the district, selecting devices, developing necessary policies and procedures associated with the migration to 1:1, and designing events aimed at keeping the community involved with the initiative as participants and decision-makers.

12.3.5 The People, the Competencies, the Culture

When approaching sizeable systemic change like digital transformation, it is essential to remember that educational staff members are not blank slates. In planning, it is necessary to consider prior knowledge and experiences staff may have in a wide array of content areas ranging from tenure to non-tenure, elementary to graduate studies. The learning sciences describe learners' prior knowledge as pivotal to new learning. Digital transformation is the ability to adopt digital technologies, methodologies, and mindsets while embracing technology as a tool to leverage work. Neglecting to provide personalized professional learning in a culture that "engages in collaborative inquiry to build the capacity of both the staff and the leadership" (U.S. Department of Education 2017, p. 45) is a significant roadblock in leveraging technology for student learning and choice in how they demonstrate understanding. Professional development is essential to growing in any organizational context; however, in the needs assessment for the study, staff identified different strengths, backgrounds, and areas of vulnerability. Attending professional development that is not personally relevant has a profound impact on learner engagement and, therefore, the subsequent implementation of new practices, which impacts student engagement. Providing personalized learning for staff not only prevents disengagement but also demonstrates that time, expertise, and growth is valued (Whitehead et al. 2013). Professional development efforts by Dr. Namow and Ms. White were comprehensive. Much of the feedback regarding the current state of professional development in Modern Mind CUSD highlighted the variety of offerings from the district and the positive impact that choice was having on teaching practices.

Knowing that the most significant professional development efforts could fail in an organizational culture of fear, Dr. Namow and Ms. White continued the focus on the ISTE Standards as a framework for change, highlighting a system that embraces shared leadership, trust, and empowerment. Breaking away from a traditional hierarchical model of leadership, a top-down, pyramid-shaped design with a clear chain of command, Dr. Namow, and Ms. White worked to cultivate shared leadership. Systemic change is too complex to be addressed in isolation. A culture in which influence, authority, and decision-making are shared and promoted throughout the school is required, having an impact on the district's context as well as teacher and leader competencies. Not only do the people in formal leadership roles have leadership capabilities but so do the teachers, staff, parents, and students, and shared leadership will leave stakeholders viewing themselves less as independent contractors, and more as a company (Whitehead et al. 2013). Each person needed to put aside individual agendas for the greater good of student learning.

Fear of failure acts as a substantial barrier to technology implementation and experimenting with learning from whatever format of professional development. Error should not be reprimanded or even simply tolerated. In the process of change, failure is expected – "More importantly, it is welcomed and celebrated, thereby communicating to teachers that they can be secure in their role as practicing learners, similar to a practicing physician or a practicing attorney, to confidently 'learn, re-learn, and explore knowledge and understanding'" (Smith and Smith 2015, p. 35).

12.3.6 A Few Adjustments

In education, whether relating to people or reform initiatives, new resources and expectations should not be merely added to existing, outdated educational paradigms to effect meaningful change in relationships. Educators and leaders need to confront tradition and discontinue the practice of completing for compliance. Dr. Namow and Ms. White have identified obstacles to digital transformation in Modern Mind. They are working to create the conditions in which technology is leveraged to empower learners to determine the right questions rather than simply providing answers. Technology and thoughtful teaching, in general, can energize learners and foster exploration. Digital tools can inspire creative, problem solvers and innovators who see learning as "an active, dynamic, nonlinear, discovery-based process – more like traveling along a spider web than moving in a straight line from point A to B" (Wagner 2008, p. 179). But few schools or districts are at that level of digital transformation just yet. What is needed are the people, the competencies, and the culture, alongside the strong leadership, resources, and organizational context, to create the change.

12.4 Implications and Recommendations

With the increased importance of developing twenty-first-century skills in students, transforming teaching and learning with technology to make progress toward digital transformation is crucial. This work requires efforts to gauge evaluation to determine the ideal combination of technology and instruction to reach learning targets, outcomes, and curricular goals in each unique K-12 organization. Patton (2008) contends that "social science has proven especially inept at offering solutions for the great problems of our time…..There is a pressing need to make headway with these large challenges and push the boundaries of social innovation to make real progress" (p. 28).

There are several implications for theory, methodology, and practice. A helpful framework for considering the factors of digital transformation in K-12 learning organizations and their interconnected systems on the macrolevel is to study the people, organizational culture, and sets of competencies. To further understand the complex interactions between these systems, it is then crucial to apply an inner framework of organizational context, leadership, and available resources. One area in which the boundaries need to be challenged and expanded is in evaluating the extent and impact of technology integration in schools, moving beyond qualitative perception satisfaction surveys, and toward the inclusion of the ISTE Standards, evaluation frameworks, and tools. At this stage of technology integration in Modern Mind CUSD, there has been little to no structure for evaluating the process of digital transformation nor what constitutes effective practices with technology, leaving its potential unrecognized. To truly transform teaching and increase both educator and

leadership capacity, there must be a shift in current evaluation tools and processes to avoid doing old things in new ways. The Illinois State Board of Education (ISBE) requires that evaluation be grounded in the purposes of accountability, improving system performance, and professional learning. The ISBE also promotes the goal of evaluation as a method to enhance teaching and learning by better preparing students for twenty-first-century society and teachers and leaders to adapt to this type of classroom and school environment (ISBE 2018). Updating current evaluation processes to include the study of technology integration processes and outcomes will provide opportunities for stakeholders to examine professional practice collaboratively to identify strengths, weaknesses, and areas for growth and development.

Evaluation tools and processes that measure the effectiveness of educational technologies will be crucial for measuring progress toward digital transformation and are an important area for future research. Studying the interconnected systems in K-12 organizations of different types may inform the planning and implementation of wide-scale digitally focused change. Studies must consider the key elements of people, competencies, and organizational culture as well as resources, leadership supports, and organizational context. Enhanced evaluation tools and measurement could also promote personalized learning and create a culture of modern learners prepared for the twenty-first century. In K-12 organizational contexts, digital transformation ultimately means the use of available digital tools and technologies to amplify educational outcomes and learner possibilities. If educational technologies are simply layered on top of outdated instructional paradigms, first-order change may occur, but not the second-order change necessary for transformation.

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Chapter 13
Resistance to (Digital) Change

Individual, Systemic and Learning-Related Perspectives

Antonia B. Scholkmann

13.1 Introduction: Resistance to Change – A Topic for the Digital Sphere?

In the wake of the far-reaching changes that digital transformation of society and work brings about, it is worthwhile also exploring the meaning of resistance to change. Digital transformation can be seen as an almost unprecedented change – both for human nature and for the nature, content, and organization of learning and work (Nagy and Koles 2014; Matzler et al. 2018; Meyer 2010; Peres et al. 2019). Because of the magnitude, the phenomenon of resistance to change also needs to be integrated into the picture. However, we must not make the mistake of applying the concept only mechanistically, or with a short-sighted lens to only some aspects such as individuals allegedly "resisting" change. Instead, a broad understanding is needed – both of the overall phenomenon of change and what it does with the individuals involved in it.

Resistance to change can, without doubt, be labeled as one of the big buzzwords in the organizational development literature, and searches on databases such as Google Scholar or ResearchGate provide impressive numbers of contributions with "resistance to change" and "employee resistance to change" as search terms. The undoubted popularity and huge scientific interest in the phenomenon can on the one hand be interpreted as the overall extent of the problem – being that it seems incredibly common that resistance to (organizational) change happens (Bareil 2013). Also, the academic writings around this concept are filled with accounts about failed or dried-up change initiatives being attributed to various forms of resistance, both from employees and stakeholders (e.g., Battistelli et al. 2013; Kuroda et al. 2016; Nov and Ye 2009; Oreg 2003; Röth and Spieth 2019; Self 2007; among others). On

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_13

the other hand, though, the scientific concept of resistance to change has been critiqued as a simplification of more complex and multifaceted processes, which play out in the wake of (organizational) change, which in itself is a complex and by no means fully explained phenomenon (Dent and Goldberg 1999).

Resistance to change has also been elaborated on with respect to digital change. In general, it can be said that change in the digital sphere is, at least conceptually, talked about as a highly disruptive enterprise, with a focus on fundamental transformations of both practices and products (e.g., Loonam et al. 2018). However, when it comes to resistance to change, the researched construct is often technology implementation, and the researched "resistances" were actually related to rejection of certain (new) technologies (e.g., Laumer 2016). And although a good number of theorists have argued that implementation and consequent adoption of new technologies is the first step towards more fundamental digital transformations (e.g., Berghaus and Back 2017; Matt et al. 2015; Murdoch and Fichter 2017; Vial 2019), the notion that digital transformation must always be disruptive has also been challenged by some (e.g., Furr and Shipilov 2019). Either way, when looking at resistance in the context of digital change, the question of whether this resistance is against an incremental implementation of new technology or a disruptive shift of an organization's identity is yet uncharted.

In this chapter, I will discuss the phenomenon of resistance to change in the light of current understandings of the concept as well as on some new elaborations, which might help to pinpoint specific challenges of digital change resistance. For this, I will dive into the research traditions that have been built up around the concept and especially into two research strands, which conceptualize resistance to change either as a phenomenon related to the individual, i.e., *employee resistance to change*, or as a *systemic phenomenon*. In order to understand resistance to digital change specifically, I will then draw upon the theory of Danish educational researcher Knut Illeris and explore the potential of his writings to explain resistance to digital change under a learning perspective. Throughout, I will use examples from my own field of expertise, specifically the digital transformation in higher education, to illustrate the respective phenomena. Key navigation points of this chapter are to elaborate resistance to (digital) change both as an individual and a systemic phenomenon, and to contribute to a better understanding of resistance to digital change in the light of incremental and disruptive change expectations.

13.2 Change and Resistance

13.2.1 Change and Resistance – Current Understandings

As can be seen from the examples from the digital field, change can mean a lot of different things: the implementation of new technology to digitalize a previously analogue process, or the complete disruptive transformation of a whole business

model, its products, customers, and values (e.g., Hinings et al. 2018). These different notions relate to long-known theoretical concepts of different modes of organizational learning, such as single- versus double-loop learning (Argyris and Schön 1978) or the exploration-exploitation dichotomy (March 1991). In variations, these theories postulate that change can either be radical and transformative or incremental, either directed towards new and innovative solutions or towards the refinement of proven solutions.

Change, it is said proverbially, is the one constant in the world. However, learning and organizational change literature is divided over the question of whether change is so natural that we all are constantly changing, and very readily so, or is an exception, which will "disturb" the normal business only temporarily (Tsoukas and Chia 2002). From a systemic perspective, it can be said that systems on the one hand crave stability and internal balance, which makes them per default resistant to change. However, since the world is developing dynamically, systems need to outbalance themselves towards this and create equilibrium by change. As has been argued, this creates the paradoxical situation that, although a system craves stability, it also needs functioning mechanisms to manage change in order to adapt efficiently to changing conditions (Burnes 2015; Boxenbaum and Pedersen 2009).

As a tangible concept, resistance to change tends traditionally to be defined along the lines of any behavior of individuals or groups which oppose managerial decisions (for an overview, cf. Burnes 2015), that is, as "(…) active or passive responses on the part of a person or group that militate against a particular change, a program of changes, or change in general." (Peiperl 2005, p. 348). Although this definition mentions both active and passive responses, the term "militate" is somewhat misleading here, since it might imply overt and hostile behaviors. However, as can be inferred from the second part of this definition, resistance can also show as defiance, nonbehavior, or other forms of passiveness towards the envisioned change (for an overview on active and passive change-resistance indicators, cf. also Piderit 2000).

Psychologically, resistance has been defined as happening on the behavioral, the cognitive, or the emotional level, or, of course, through a combination of these (Piderit 2000). But when it comes to defining concrete and observable indicators, the literature is somewhat ambiguous as to what should be counted as "resistance." Some studies have tied to operationalize resistance, for example, as inflexibility towards job changes (McGuinness and Cronin 2016); others have pointed out emotional reaction or cynicism (Grama and Todericiu 2016). A common notion throughout the literature also seems to be that resistance will show in the failure of an envisioned change imitative and resulting losses in productivity and revenue (e.g., Matt et al. 2015) – thus "blaming the less powerful for unsatisfactory results of change efforts" (Krantz 1999, p. 42). Newer research has engaged in reframing resistance as ambiguous feelings towards change (e.g., Piderit 2000).

13.2.2 Employee Resistance to Organizational Change

In the current literature, the phenomenon of resistance to change is discussed with a strong focus on employee resistance to organizational change. Under the assumption of people's "natural tendency to prefer keeping to what is well-known and familiar rather than to accept innovation, and thus the unknown" (Laumer 2016, p. 1), many publications are concerned with unravelling causes for these individual resistances, and with formulating management advice on how they can be overcome. Part of this literature thereby focuses on resistance as a personality trait or disposition (e.g., Nov and Ye 2009; Oreg 2003), which makes certain individuals more prone to resist change than others. The majority of publications, though, finds causes for resistance in values, motives, emotions, cognitive structures, and cultural norms of individuals, that play together to make said individuals hesitant or overtly hostile towards an intended change in their organization (e.g., Danışman 2010; Howard and Mozeiko 2015; Jost 2015; Pardo del Val and Martínez Fuentes 2003; Oreg 2006). Measures to overcome this employee-related resistance to change are also located at different levels: work-psychological measures, such as increased task autonomy or feedback, are promoted (Battistelli et al. 2013); organizational development in a broader sense is advocated for sense making (Röth and Spieth 2019) or the integration of several facets of resistance (Cervone 2011; O'Connor 1993), while humanistic recommendations favor, for example, the concept of spirituality (Lawton 2017).

While parts of the respective literature show a tendency to position individuals as potentially "defiant" entities in the otherwise unproblematic change process, this notion of resistance to change that neglects the interpersonal nature of the phenomenon has been challenged. In a more "modern" (Bareil 2013) interpretation, employee's resistance of change is treated as important feedback about potential flaws within a change process, and mismatches among employees' motives, needs, and values and those brought about by the intended change (Harvey and Broyles 2010; Perren 1996).

What is problematic with both perspectives – the traditional and the modern alike – is the fact that they allocate the phenomenon unilaterally on the side of the change recipients, who are seen as either sabotaging the process or serving as the "canary in the coalmine" to optimize it. Under specific critique stands the relation between change agents, i.e., actors who, on behalf of the organization, promote the change, and change recipients, i.e., actors who are the carriers of the change measures. Here, it has been argued that a focus on employees as change recipients as the (sole) location of resistances neglects the dynamics between the different stakeholder groups (i.e., change agents) involved (e.g., Ford et al. 2008; Klonek et al. 2014; cf. also 2.2). Also, it has been shown, based on the study of acceptance and resistance towards policy-induced changes in hospitals, that the dichotomy between change agents and change recipients can be artificial, since these social roles can and will change dynamically over time during the process (McDermott et al. 2013). The same study also challenges the dichotomy between acceptance and resistance

to change by showing the variety of reactions towards this kind of mandated changes. Last but not least, the construction of resistance to change as employee resistance to organizational change bears an inherent power imbalance, since this endows the change agent with the unilateral capacity to diagnose resistance and the power to overcome it (Thomas and Hardy 2011; Vos and Rupert 2018).

13.2.3 Resistance to Change as a Systemic Phenomenon

Already more than 20 years ago, Dent and Goldberg (1999) pointed out that the oversized focus on employees as the major force of resistance to change might have originated in a misunderstanding of the original conceptualization of the term by German-American organizational researcher Kurt Levin (cf. also Ford et al. 2008; Mathews and Linski 2016; McDermott et al. 2013): In his field theory, Lewin described the phenomenon of resistance towards organizational change as arising either from a lack of strong enough forces to induce change, or from the prevalence of too strong barriers towards these forces that hinder the occurrence of change in a given system (Lewin 1947). From a systemic perspective, it can be said that systems on the one hand crave stability and internal balance (*homeostasis*), which makes them per default resistant to change. However, since the world is developing dynamically, systems need to outbalance themselves towards this and create (new) equilibrium by change (Goldstein 1988). Given that, change will happen if either the external pressures on the system are strong enough to disturb its homeostasis, or if the system's barriers towards the outside are weak or low enough for new information to break through. Taking this perspective, resistance must be seen as the phenomenon of a stall to change that can be caused by a multitude of influences, under which the individual is only one factor (Kotter 1995).

The idea that resistance to change emerges from a complex interplay between driving and resisting forces can be found in studies which focus on the dynamics of change. For example, it has been shown that during change-related communications, change-recipients show information about the prevalence of driving versus blocking change forces, and that change agents can provoke these forces in the respective communications (Klonek et al. 2014). Also, it has been pointed out that a systemic view allows the analysis of institutions and organizations as being resisting entities to change: for example, when they object to the (legitimate) demands of minorities and marginalized groups to reduce discriminations (Agócs 1997). To address the complex interplays between driving and resisting forces, Lewin's theoretical groundwork has been extended towards the concept of action research (Burnes 2004), which serves as an organizational development approach to dynamically integrate resistance – also in the wake of digital transformation (Argyris 1993; Baskerville and Myers 2004; Chevalier and Buckles 2019).

The idea of competing field forces can eventually also be extended to understand broader dynamics of change and resistance, and this view resonates well with research on digital change in the field of higher education. Here it has been

researched and discussed for many years that the mere implementation of learning technology has not led to substantial transformations in teaching practices (e.g., Blin and Munro 2008; Kirkup and Kirkwood 2005). For the last two decades, various forms of "resistance" on the teachers' side have been discussed, as have more complex explanations (e.g., Torrisi-Steele and Drew 2013; Matrosova Khalil 2013). With the arrival of the Covid-19 pandemic and the closing down of physical education in many countries, the state of digital transformation of higher education has changed dramatically. Put bluntly, all "resisting" barriers to digital teaching at this point seem to be outweighed by a steep increase in the power of the forces demanding (immediate) change (Kerres 2020). It still needs to be studied, however, to what extent this ad hoc change will lead to sustainably transformed digitalized practices beyond crisis mode.

13.3 Addressing Resistance to Digital Change as a Learning Challenge

> … when it comes to digital transformation, *digital* is not the answer. *Transformation* is. (Westermann 2018, p. 116)

As elaborated in the first paragraphs of this chapter, digital change is often expected to yield huge transformative and disruptive powers (Jesse 2018; Matzler et al. 2018). Given that digital change is in its core about transformation, the individual and its resistances comes back into focus. However, the role of the individual here is not that of an opposing force, as it tends to be conceptualized in research on employee resistance to change. Instead, the individual here can be seen as an "agent of change" (Syakdiyah et al. 2019, p. 165), who acts as the mediating entity between macrolevel organizational changes and microlevel enacted behaviors (Schmid 2019). In this notion, engaging with or "resisting" change becomes a question of engaging in or resisting learning.

Although, generally speaking, "(t)he relationship between individual and organizational learning remains one of the contested issues in organizational learning debates" (Antonacopoulou 2006, p. 455), it is the understanding that individuals and their learnings form the foundations of change at the group and organizational level (e.g., Kim 1998). Also, analogies have been drawn between the (psychological) research on learning processes and the development and change of organizations (Cohen 1991; Döös et al. 2015; Rodan 2008). Interestingly, theoretical and empirical underpinnings for the conceptualization of the individual as the actual carrier of organizational change and transformation can be explicitly found in writings from the sphere of digital change, again, where an interplay between conceptual changes within the individual's cognitive structures and consequent transformations in organizational identity is being proposed (e.g., Jahn and Kurse 2019; Murdoch and Fichter 2017).

13.3.1 Knut Illeris: Dimensions, Processes, and Types of Learning

In order to grasp this idea further, I want to dive into the learning theory of Knut Illeris (2003, 2009a, b, c, 2017), which I propose as a comprehensive framework by which to understand how individual learning dynamics can be related to organizational change. In his theory, which can be seen as a synthesis of other theorists' works (cf. Illeris 2009a, p. 8), the author conceptualizes three dimensions and two processes of learning. Within the individual, learning takes place as a balancing of the dimensions of *content* (knowledge, understanding, skills) and *incentives* (motivation, emotion, volition). These internal dimensions are supplemented with a third, which is the *interaction* (action, communication, and cooperation) between the individual and its environment. Not unequal to the previously described force field assumptions of Lewin, learning is triggered also in this theory by the interaction between the individual's internal regulation processes and the affordances of the external world. (For a more detailed overview, cf. Illeris 2003, 2009a, b, c.)

According to Illeris' assumptions, learning will happen in different forms (or "types", Illeris 2009a, b, c, p. 8): as *cumulative learning*, being a simple add-on procedure to stock up factual knowledge; as *assimilative learning*, being the integrating of new information into existing mental schemes; as *accommodative learning*, being the adaption of mental schemes to fit with new information; or as a new type of learning, labeled either *significant, expansive, transitional,* or *transformative learning* (based on the respective theorists, cf. Rogers and Freiberg 1994; Engeström 2015; Alheit 1994; Mezirow 1991), which comprehensively means an extensive rearrangement of mental schemes and human identities (Illeris 2015).

13.3.2 "Nonlearning" as Resistance to (Digital) Change

Illeris' writings provide a systematization of so-called nonlearning phenomena, which theoretically can be used to interpret resistance to change. The first is *mislearning*, which is related to the content dimension and describes instances where content other than the intended is learned, either by accident or lack of attention. Also, mislearning can only be clearly detected with relatively simple tasks where a clear detection of "wrong" content is possible (Illeris 2017, pp. 158). The second phenomenon is *defense against learning*, which, related to the incentive dimension, describes the "classical" motivational resistance. Defense against learning is assumed to happen mostly subconsciously and is therefore seen as hard to address. It can show in various subforms such as open rejection, blocking, distortion, or neurotic symptoms (ibd., pp. 160). The third phenomenon is *resistance to learning*, related to the interaction-dimension. As opposed to defense, resistance to learning is active and conscious, thus energizing, which makes this reaction also a potential basis for the initiation of transformative learning experiences (Illeris 2009a, p. 16).

As might be already obvious, these three types of nonlearning resonate with the conceptualizations of employee resistance to change in Sect. 13.2.1, and, more generally, with the three proposed psychological dimensions of resistance, being emotional, cognitive, and behavioral (cf. Piderit 2000) (cf. Fig. 13.1). Mislearning, in a way, can be seen as the equivalent to cognitive resistance, which here should be seen as an intended or unintended (mis-)interpretation of the change content. Applied to the envisioned transformative learning under digital change initiatives, mislearning can, for example, mean misunderstandings about the nature of technologies, their functionalities, etc., and a resulting failure to use and/or transform them.

Defense against learning shows similarities with emotional resistances, which makes sense especially since both concepts have been described as being rooted in early understandings of subconscious rejections based on internal psychodynamics (Burnes 2007; Illeris 2009a, b, c). With that, defenses/emotional reactions are certainly the hardest category to address, since they (can) relate to more or less deeply rooted emotional experiences and are often not consciously accessible. At the same time, they are also the closest to the "target dimension" of transformative (digital) change – that is, to a person's identity, and therefore can provoke substantial resistance.

Resistance to learning, described as an active process, mirrors the behavior-related dimensions of resistance to change, and in both Illeris' theory and in the change management literature, the behavior dimension is seen as the point of entry

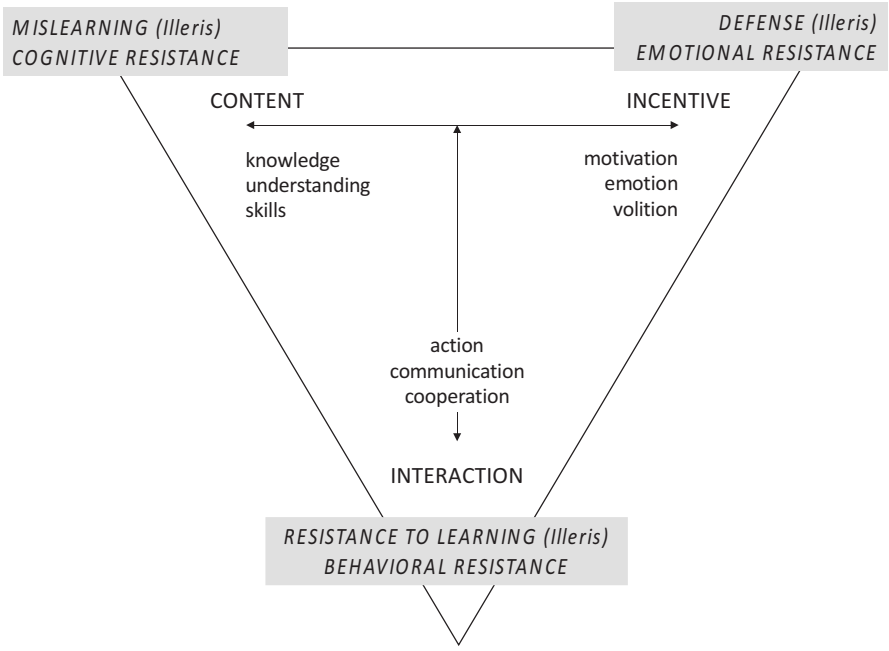

Fig. 13.1 Dimensions of learning, nonlearning, and resistances to change. (Based on Illeris 2009a, b, c)

to work towards developing creative solutions (Austin and Bartunek 2003; Illeris 2009a). However, neither the literature on resistance to change nor Illeris are very outspoken about possible forms this resistance can take. For the time being, we can assume that, related to the desired transformative learning taking place, resistances here might show as active oppositions – for example, by questioning proposed measures – which can serve as starting points for integrative and transformative conversations (e.g., Matthews 2019).

13.3.3 Mismatches in Learning – An Undetected Form of "Resistance"?

As elaborated in the previous paragraph, the nonlearning dimensions in Illeris' theory can be used to describe and systematize individual resistances in specific situations of (digital) change processes. However, they are clearly rooted in the individual, and thus lag behind from a more systemic perspective, which is able to describe perceived resistances to change as an interplay between individual and organizational forces and barriers. As an addition to the elaborations made before, I would like to use another part of the theory to broaden the perspective on how resistance to digital change can eventually be interpreted in this sense. This part relates to the four types of learning mentioned above.

Applied to the sphere of digital transformation, we can assume that individuals will potentially engage with technology in these four modes:

- *Cumulative:* Learning about technology, i.e., acquiring basic knowledge about tools and their functionalities
- *Assimilative:* Learning how to use technology to perform well-known procedures
- *Accumulative:* Learning to do new procedures based on the opportunities of new technology
- *Transformative-expansive:* Generating new ideas to understand, structure, and influence the world

These modes of engagement can happen based on these individuals' assumptions what a given situation of change calls for, i.e., given on their interpretation of this situation (Illeris 2015). Perceived "resistance" to change in this light can be interpreted as a mismatch between an expected learning activity and executed learning activity.

This assumption might sound technical in nature: by ensuring an adequate match between the desired form of organizational change (being either incremental or disruptive) and the corresponding learning activity by the individual, leaders and managers should be able to design resistance-free change processes. However, as discussed earlier, change, and resistance towards it, must be understood as a complex interplay between organizational and individual driving and blocking forces, and it may not be possible to engineer resistance-free processes to a perfect degree.

The idea of matching must be interpreted more widely in this case: as a negotiated and communicated mutual understanding of what a specific situation calls for to ensure successful change, and which forms of learning might match with organizational learning and change needs (Augustsson et al. 2013; Boateng 2011; Ji Hoon Song and Chermack 2008; March and Olsen 1975).

It also needs to be stressed, again, that conceptualizing an alleged resistance to change as a mismatch between expected and enacted learning practices does not touch on the other forms of resistance to learning (cognitive and emotional) from the model above. While these other forms allow for their allocation within the individual, the mismatch-conceptualization addresses the interplay between individual and organizational learning. Illeris (2004) himself has elaborated on how the interaction-dimension bridges into collective learning processes in the workplace, where the individual's learning potentials and practices interact with the technical-organizational and the social-cultural work environment and constitute an enacted work practice (cf. also Illeris 2011).

To underpin this idea, I am drawing again on evidence from the sphere of digital transformations of higher education. Programmatic writings here have advocated the potential of digital change for far-reaching transformation and changes, both in terms of the extent and innovation of technology use, but also at the level of the underlying pedagogical assumptions and practices (e.g., Duignan 2020; Meyer 2010; Salmon 2014). However, a broad corpus of studies has shown that the actual practices, mainly in the arena of digital teaching and learning, lag behind on transformative or even accumulative practices (e.g., Blin and Munro 2008; Lai and Hong 2015). This effect, it can be hypothesized, can be attributed to the fact that signals within the respective institutions or systems encourage prioritizing cumulative or assimilative approaches to technology (Hinings et al. 2018). For example, it has been argued that many institutional digitalization strategies in higher education prioritize the digitization of teaching material over a change in digitalized teaching practices (Sandkuhl and Lehmann 2017), although others, where in place, have been shown to lead to higher technology integration rates compared to where no institutionalized strategy has been in place, overall (Tømte et al. 2019).

Also, as has been analyzed with respect to the evolvement of higher education learning management systems, these tended to be used following "traditional" conceptions about teaching and learning, resulting in an assimilative usage of these to follow transmissive learning conceptions (Van den Berk 2013). In line with that, it could also be shown that digital transformation in some areas of research, which also have advanced practices of knowledge sharing and networked collaborations, is far more advanced than it is in higher education teaching (Scanlon 2014). Last but not least, higher education teachers themselves have expressed that in order to use digital technologies in more advanced (accommodative or transformative) ways, they do not need more specific technological support but crave helpful relationships (e.g., by academic developers) to scaffold their transformative changes at the crossroads between technology and pedagogical identity (e.g., Ching and Wittstock 2019; Thoring et al. 2018). Accordingly, it could also be shown that practices which led towards a shared collective understanding and institutionalization of digitally

enhanced teaching and learning held the potential for overcoming barriers in adoption (Martins and Baptista Nunes 2016).

13.4 Resistance to Digital Change – Unanswered Questions

This chapter presented a suggestion on how to disentangle the phenomena of resistance to change and digital transformation, and to explore their interwoven and common grounds. To this end, I elaborated in the first part of this chapter on current understandings of both change and resistance as concepts in organizational development research, and on possible implications of this for understanding the phenomena of resistances to (digital) change. In the second part, I presented and discussed the learning theory of Knut Illeris as a comprehensive approach to understand resistance to digital change – and especially transformative change. However, as the phenomenon of digital transformation is a topic "in the making," so too are my elaborations. Naturally, this leaves open ends at this point, and some topics need to be explored further.

Framed as a question, we firstly need to ask what organizations can do to create a climate which outbalances driving and resisting forces to (digital) change, constructively, and in which adequate change is enabled through matching expectations and executions of learning. As elaborated in the beginning of this chapter, the concept of resistance to change shows a tendency to circle around the individual as both the source of and the solution to this phenomenon. Even in the present text this is prevalent, since its focus is on individual learning as the basis of organizational change. Taking seriously that resistance to change is in fact multifaceted and systemic, we can assume that the organization acts as an autonomous entity in this, which holds valid interests that need to be mediated through leadership (e.g., Amy 2008). Processes of negotiation and coconstruction can clarify change objectives, goals, and practices, which allow for the creation of shared understanding of learning needs and directions at the organizational and individual level As with other fields of organizational theory and research before, the field of (higher) education can provide an interesting template here since it already holds high degrees of self-organization and collegial negotiation practices, which should be used and bridged towards digital transformative processes (Scholkmann 2011; Vial 2019).

A second question is in how far digital transformation can be an imposed, mandated change process, after all – given that identity transformations are at its core? As research from the tradition of Scandinavian New Institutionalism (Boxenbaum and Pedersen 2009) on the implementation of managerial concepts has shown, a mere top-down transfer will likely lead to the resistance form of "ceremonial" adoptions, with no change in practices or identities (Sahlin and Wedlin 2008). Also, some authors have argued, again for the field of higher education, that a "collective willingness to change" (Graf-Schlattmann et al. 2020, p. 19) is needed to overcome field-specific resistances and to bring about sustainable digital change. An important point here seems to be that the adoption and transformation of a concept cannot

be expected to result in solutions that look equally similar. Instead, variations must be seen as legitimate local reinterpretation of an idea (c.f. Scholkmann 2020, for an example on how this applies to educational change), which stresses again the need for collective and interactive interventions which lead to transformed digital practices and identities both at the individual and at the organizational level.

A third question, moreover, is in which ways resistance to changes relates to the concept of agile organizations, and whether agility can be seen as way to overcome the sometimes "traditional" notions of resistance, especially with the focus on employee resistance and the dichotomy of change agents and change recipients. At least one study has explored resistances and barriers that were prevalent in the wake of an agile digital transformation project (Nerurkar and Das 2017), while another has dived into the creative potential of crises that can happen in a digitally transformed company (Kazanjian et al. 2000). However, more research and theory seem to be needed to better understand the dynamics of change acceptance and resistance that can arise in new forms of work beyond traditional hierarchical institutions.

Last but not least, it can be asked whether the comparison of change and learning applied in this chapter stands up to close scrutiny of these two concepts. The notion of change and learning following the same principles has been argued by learning researchers engaged in inquiry-based and problem-based learning and by organizational development researchers, alike (Chidiac 2013; Loyens et al. 2015). Also, learning and development theories seem to underpin these assumptions (e.g., Vygotskij and Cole 1981). However, a more thorough exploration and empirical underpinning of these assumptions could be a worthwhile enterprise.

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Chapter 14
Digital Transformation in Learning Organizations

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14.1 Introduction

In the light of the title of this book, *Digital Transformation in Learning Organizations*, the demands on digital practices due to the spatial changes in work as well as in learning and teaching present themselves as a new thrust in the discussion about digital change in organizations. For instance, the increasing number of web conferencing tools in organizations during the COVID-19 pandemic is a phenomenon the extent of which cannot yet be predicted. Future studies will show how sustainable the rapid developments in the context of digital technologies in organizations are or whether they are only an expression of a state of emergency. However, as Grünberger and Szucsich (Chap. 11 in this volume) emphasize, the COVID-19 pandemic also shows the necessity of integrating aspects of environmental and climate protection into processes of digital transformation of organizations.

This anthology was produced in the final phase of the #ko.vernetzt project and contains 13 chapters contributing both perspectives from the project (Part I) and international perspectives (Part II) on digital transformation of learning organizations. The contributions provide indications of the complexity of the perspectives on digital transformations in learning organizations and the dimensions required for the theoretical and empirical capture of digital transformation processes. This

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D. Ifenthaler et al. (eds.), *Digital Transformation of Learning Organizations*,
https://doi.org/10.1007/978-3-030-55878-9_14

concluding chapter attempts to systematize the several and sometimes heterogeneous positions from the individual contributions and elaborate the theoretical approaches.

Thus, the following questions arise at the conclusion of this volume: What dimensions are involved in digital transformation of learning organizations (cf. Section 2)? Which design perspectives can be used for digital transformation in learning organizations (cf. Section 3)? This final contribution tries to first find cursory answers to these questions without claiming to be complete or to be a theorization. The aim is rather to emphasize the points of intersection of the contributions. Finally, the perspectives are linked to the case and project of #ko.vernetzt, which provided the context for this volume (cf. Section 4).

14.2 Dimensions of Digital Transformation in Learning Organizations

The book title raises various questions in connection with the so-called digital transformation. These are fundamental questions, as long as they refer to the transformation of society in the context of its sociality and digitality. They also address very concrete questions in connection with (multiple) single cases, which evoke different concepts and measures in specific organizational contexts. Thus, organizations are also affected by various developments and demands of society. They react to them in several ways described throughout the book.

One of the main questions entangled in the volume is of how digital transformation in learning organizations is to be understood. As many contributions show, the work of Argyris and Schön (1978) remains fundamental to theoretical and empirical perspectives on the digital transformation of learning organizations. Accordingly, "organizational learning occurs when members of the organization act as learning agents for the organization, responding to changes in the internal and external environments of the organization by detecting and correcting errors in organizational theory-in-use, and embedding the results of their inquiry in private images and shared maps of organization" (Argyris and Schön 1978, p. 29). The contributions collected in this volume reference to different dimensions of digital transformation which are linked to several theories of learning organizations. At least four dimensions can be identified as follows:

(a) **Technical changes in organizations.**

Considering the contributions of Barabasch and Keller (Chap. 7 in this volume), the first dimension of digital transformation in organizations presents itself as a technical object. Thus, development issues in organizations often arise in connection with the implementation of technologies that are expected to increase efficiency and effectiveness. Here, theories of neo-institutionalism offer perspectives on collective rationality in organizational fields, and isomorphisms can provide explanatory models for such phenomena. The theoretical approach explains structures and

modes of operation of organizations by referring to norms, expectations, and concepts of the institutional environment (DiMaggio and Powell 1983).

(b) **Changes in routines and practices.**

The implementation of technologies does not necessarily lead to the initiation of development processes in all cases of learning organizations. This leads us to the second dimension: As Dörner and Rundel (Chap. 4 in this volume) have elaborated in detail, previous practices must become obsolete in order to initiate educational processes. This "crisis" leads to educational processes in which routines as well as social and cultural orientations are questioned by the actors of the organization and the organization itself. Zeuner (2020) states that educational discourses in the context of crises often understand education as an instrument for maintaining economic growth and employability. However, if education is seen as an integral part of social development, it complements and supports politics and society by helping to shape and influence them (Zeuner 2020). In their contributions, Iovinelli and Elkordy (Chap. 12 in this volume) and Schiffbauer and Seelmeyer (Chap. 8 in this volume) show ways in which the implementation of new technologies, education, and the change of action practices in organizations are linked and can be put into practice.

(c) **Technologies as a learning medium.**

The third dimension of digital transformation in learning organizations is represented by digital technologies. They are often described as a medium of and for learning, thus promoting new skills and practices. In this context, reference should be made to the international discourses on digital and media competence, such as the DigComp Framework (Carretero et al. 2017). Here, however, critical aspects of the discourse on media competences also become apparent, e.g., an instrumental shortening (Altenrath et al. 2020, in press). Therefore, the third dimension can be linked with the first and second dimensions of digital transformation in learning organizations, but not necessarily depending on the methodological approach of the articles. Following the contributions of Barabasch and Keller (Chap. 7 in this volume) as well as Cattaneo, Bonni, and Rauseo (Chap. 10 in this volume), this dimension can be connected to perspectives of instructional design (Ifenthaler 2017).

(d) **Technologies as consulting and decision-making tools.**

The fourth dimension is related to the increasing possibilities and use of data and algorithms. The contributions of Meier and colleagues (Chap. 5 in this volume) as well as Berisha-Gwalowski, Caruso, and Harteis (Chap. 6 in this volume) show that the use of cyber-physical systems and smart machines holds potential for improving learning activities of individuals in organizations and for the development of organizations themselves. Here, digital technologies present themselves as consulting and decision-making tools that can have a decisive influence on the direction of digital transformation in learning organizations. Similar developments can be seen in other fields of education, for instance, Ifenthaler, Mah, and Yau (2019) provide insights into opportunities of learning analytics in the field of higher education which leads to organization-wide change processes (Ifenthaler 2020; Ifenthaler and Gibson, in press).

In summary, the connection of the four dimensions can be differently pronounced. While digital transformation in most cases requires the implementation of technologies, technologies as consulting and decision-making tools are still scarce.

14.3 Theoretical Perspectives on Digital Transformations in Learning Organizations

The digital transformation of organizations implies different dimensions, which make their immediate design and further development from a perspective of research and practice unequally challenging (see Chap. 2 in this volume). If one observes the developments in detail, one can identify different approaches to the field of the development of organizations at the same time. They are usually theoretically founded, so that the research process and the possibilities and impossibilities of individual or organizational development can be derived from this basic understanding. The contributions of this volume have shown that the development of organizations is often pursued based on a common concern. But the perspectives differ: for example, to which extent research in practice intervenes with and through research, and in what manner assumptions of effects are made? This makes it important for us to accentuate the particular theories that are related to the learning of organizations.

The contributions of Iovinelli and Elkordy (Chap. 12 in this volume); Cattaneo, Bonini, and Rauseo (Chap. 10 in this volume); Kowch (Chap. 9 in this volume); and Schiffbauer and Seelmeyer (Chap. 8 in this volume) as well as the contributions from the project #ko.vernetzt (Bröckling, Behr & Erdmann, Chap. 1 in this volume; Helbig, Hofhues and Lukács, Chap. 2 in this volume; Egloffstein and Ifenthaler, Chap. 3 in this volume) show that learning organizations continue to depend on the human actors in the respective organization, even in the context of digital transformation. The contributions include different theoretical perspectives on development and design aspects around learning organizations. Although these perspectives are not exclusively linked to digital transformation, the significance of the individual perspectives is demonstrated in connection with digital technologies.

14.3.1 Individual Participation and Organizational Change

Participatory approaches to organizational development are not new. However, the contributions by Schiffhauer and Seelmeyer (Chap. 8 in this volume); Bröckling, Behr, and Erdmann (Chap. 1 in this volume), and Helbig, Hofhues, and Lukács (Chap. 2 in this volume) show that participatory approaches are gaining importance in digital transformation processes in organizations. Participation, understood as the involvement of as many different actors from the organization as possible, has the

purpose of increasing motivation for change and reducing anxiety. Participation also serves to incorporate the specifics of the organizational fields, for example, educational organizations (Helbig, Hofhues, and Lukács, Chap. 2 in this volume) or social welfare organizations (Schiffhauer and Sellmeyer, Chap. 8 in this volume), and the specifics of the particular organization itself into the development processes. Approaches and methods of design thinking and human-centered design (HCD) are being increasingly established here. However, questions of decision-making and hierarchies and the assumption of responsibility continue to arise, especially in complex and networked organizations.

14.3.2 Leadership between Professionalization and Strategy

Both Iovinelli and Elkordy (Chap. 12 in this volume) and Kowch (Chap. 9 in this volume) stress leadership as a core area of digital transformation. Kowch places particular emphasis on innovations, informal networks, and experiments. Models such as digital leadership in education (Sheninger 2019) can be connected to this. Overall, these leadership models illustrate a changed understanding of leadership in the context of digital transformation. The new understandings take into account that, on the one hand, knowledge and practices are becoming increasingly differentiated and expert knowledge is becoming more fragmented, while, on the other hand, knowledge and practices are becoming obsolete more quickly and must be renewed. Cattaneo, Bonini, and Rauseo (Chap. 10 in this volume) follow on from this argument and focus on the development of new professional groups and their professionalization. The example of the "digital facilitator" shows that digital transformation in educational organizations is increasingly dependent on specialized knowledge that can be expected neither from IT experts nor from education experts. In the future, both new personnel requirements and empirical questions will arise (Ifenthaler 2018).

14.3.3 Resistance and Inertia

As an important perspective on digital transformation in learning organizations, Scholkmann (Chap. 13 in this volume) highlights resistance to change. The author emphasizes in the tradition of Argyris (1993) and Kotter (1995) that individual resistance is only one aspect and that both organizations and organizational fields can offer resistance to change. Initial solution options can be found in the previously mentioned contributions. From the perspective of learning organizations, however, further research questions arise on the phenomena of resistance in the context of digital transformation. Does such a resistance necessarily lead to organizational inertia? What are the positive aspects related to organizational resistance, and what potentials does it provide?

14.4 Considerations to #ko.vernetzt

The challenge is still to transfer single concepts and measures to a specific case. The specific case that motivated us to edit this volume was the project #ko.vernetzt and within it a specific educational organization. The project has tackled different issues, which are all located between research and either practice or application in the field of digitization, digital learning, and digital transformation.

What became clear with reference to Argyris and Schön (1978) is that there is technical change in an exemplary analyzed organization. We have observed the change of routines as well as the change of concrete practices. They have also been quantified and described through various surveys. With regard to the role of technology, our research has confirmed different assumptions. However, it has also allowed various interpretations, which were based on the different assumptions of our research in the methodological paradigms. Results have stimulated each other. It became evident that digital technology has one function in the management of an organization. They sometimes occur as decision-making tools.

The contributions in this volume offer various readings of how the project #ko.vernetzt can and should be included in the discourse on learning organizations. The focus is on the relationship between the individual on the one hand and the organization on the other – a relationship that is also understood as subjectivation. Subjectivation is here reduced neither to an event of unfolding, development, or self-construction nor to mere socialization, but must be understood as a constitutive interlocking of foreign and self-reference. Subjectivation therefore refers to the process of learning to lead one's own life under the leadership of others and to oneself in other peoples and worlds' relations. In this understanding of subjectivation by Butler (1990), research questions mainly focus on the processes in which people in learning organizations and in the context of digital transformation are made subjects by others as well as themselves. Other research questions have also been generated in the sight of the discussions of leadership. They were condensed through digitalization. Resistance, whether to learning or to organizational change, is also a constant topic in research literature on the learning organization. Thus, #ko.vernetzt with the educational organization involved proves to be a quite typical case.

All findings feed the discourse, but the question is how they can also lead to the development of practice. We assumed on a meta-level that the interlocking of findings and their reflection in the practice of the educational organization would have implications for later action in the organization. The contributions provide various insights into the extent to which research results lead to changes in practice and what kind of participation is possible in the organization. However, the visible differences prove to be particularly productive for the learning organization if they enable themselves to reflect on findings and place them in the context of their own organization. With research projects such as #ko.vernetzt, it is therefore not a matter of working out precisely fitting results for a direct transfer into action mechanisms and management requirements, but rather of creating a social space for reflection on the development of practice, which can only be created through research-based

approaches to practice. Accordingly, this volume also emphasizes that digital transformation of learning organizations must be reflected on different levels. In addition to technical issues, they include social aspects as well as the field of leadership. In short, organizations become learning organizations if they put themselves in a position to reflect. This was a continuous mantra of the project #ko.vernetzt.

Acknowledgments This research was funded by the German Federal Ministry of Education and Research from 2017 until 2020 (funding reference number 01PZ16002A-D). We would like to thank the praxis partner for enabling on-site research and all other people involved in the project for their cooperation and participation.

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