Learn how Digital Transformation Could Diffuse into Organisations

Impact of Motivation and Innovation on Digital Competences and Learning

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***Abstract*—Digital transformation reshapes workplaces, requiring individuals to develop digital competencies. This study examines how self-determined motivation and innovation adoption influence digital competence and sustained learning. Based on the theories of Self-determination (SDT) and Diffusion of Innovation (DOI), we analysed survey data from 152 participants via PLS-SEM modelling. The findings show that innovation adoption significantly drives digital competence, while motivation alone has a limited direct effect. However, digital competence mediates the relationship between motivation, innovation adoption and learning. These insights highlight continuous learning as a core capability for digital transformation. Organisations should prioritise upskilling, and policymakers should foster frameworks supporting innovation adoption. Future research should explore additional factors influencing digital adaptation.**

Keywords- Digital transformation; digital competences; learning; innovation adoption; self-determination; knowledge management.

I. INTRODUCTION

Digital transformation reshapes workplaces, jobs, and tasks [1], requiring employees to develop digital competencies to adapt to evolving job demands. Governments expect that new technologies and digital offerings will benefit companies and citizens. Therefore, the current restrained acceptance of digital technologies needs to be investigated. Research indicates that the benefits can only be achieved when individuals are ready to adopt it [2]. Factors, like motivation, self-efficacy, innovation adoption, leadership support and organisational learning, are highlighted as critical enablers in previous literature [3]. Deci & Ryan's Self-Determination Theory emphasises the role of autonomy, competence, and relatedness in fostering intrinsic motivation [4]. Meanwhile, Rogers' Diffusion of Innovation Theory focuses on the attributes influencing how innovations spread among individuals [5]. By combining Self-Determination Theory and Diffusion of Innovation Theory, we link the motivation to engage with the perception and adoption of innovations, as previous studies show that motivation affects adoption. However, the whole pathway (including competence and learning outcomes) is still not sufficiently explored. New competence profiles have been developed and adapted to the changed work requirements. Hartmann, et al. [6] identified and categorised so-called "future skills", which are defined as competencies to solve challenges in an uncertain and changing environment. However, there is still insufficient knowledge about new competencies for "learning 4.0" in workplaces [7]. Existing research on digital transformation often investigates individual motivation and innovation adoption independently and lacks integrated models showing how they affect digital competence and learning. There is a lack of empirical evidence better to understand digital learning triggers and scalable competency development. To fill the existing knowledge gap on prerequisites of individual digital competencies, we combine the research streams of innovation adoption and motivation with studies investigating education and learning, developing "future" competencies for transformation [8]. These new insights will contribute to digital transformation by empirically testing how motivation and innovation adoption contribute to digital competence and learning using an integrated framework, as the rapid pace of technological change makes this interplay more urgent. The rest of this paper is organised as follows. Section II describes the theoretical background and the derived hypothesis. Section III describes the methodology. Section IV displays the results; Section V addresses the ongoing scientific discussion. Section VI concludes with the contributions of this paper and the future research agenda.

II. THEORETICAL BACKGROUND AND HYPOTHESIS DEVELOPMENT

Since there is no common definition of digital transformation, this paper adopts the summarizing postulated by Vial [9] and defines digital transformation as "a process aiming to improve services, processes, or treatments by triggering significant changes through combinations of information (documentations, data), computing (AI), communication (networking, virtual treatments), and connectivity technologies (interoperability)". To succeed in digital transformation and sustain this never-ending process of learning, organisations need to develop dynamic capabilities. Dynamic capabilities are defined as the "…firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments" [10]. Developing digital competencies, knowledge management, and deployment is a new challenge [11]. Learning and knowledge are the dynamic capabilities for continuous innovation to enable digital transformation [12]. We assume

sustained learning in this context as a new essential dynamic capability and digital competencies, therefore, as the first building block to be developed for this desired outcome. This paper investigates the relationship between motivation, innovation adoption, and digital competencies & learning on an individual level.

A. *Dependent variable: Learning*

Current literature displays learning as a basic factor in performing in digital environments through knowledge and competence. However, there is no common concept of learning in digital transformation. Crossan et al. [13] highlight the complexity and different viewpoints on individual, group, and organisational levels, as well as cognitive and behavioural factors. Learning enables individuals and organisations to perform and innovate under rapidly changing conditions. Fiol et al. [14] define organisational learning as "…the process of improving actions through better knowledge and understanding". Argyris et al. highlight individuals' needs and the effect on their well-being and motivation to improve learning [15]. This adaptability and continuous learning must be established to perform in changing environments under uncertain conditions [16]. Previous research implies the positive influence of organisational learning as a contextual factor on innovation adaptation and digital competencies [17]. Individual learning, in contrast, is an intrinsic factor that is assumed to have a reinforcing effect on the presumed positive influence of self-determined motivation on digital competencies. This paper measured and tested learning on organisational and individual levels to better understand the mechanisms impacting the targeted transformation process [18].

B. *Independent variable: Self-determined motivation*

Self-determination theory was developed to understand intrinsic motivation and why people do things out of interest for their own sake. Deci et al. postulated that all employees have basic needs for autonomy, competence and relatedness; their satisfaction and motivation cause this effect [4]. Applying this theory to digitally transformed workplaces, it explains motivation as a basic mechanism for employees to withstand changing situations. Interacting with the environment and adapting leads to learning over time [19]. Based on this, we assume that employees are more motivated to acquire digital competencies when their basic needs are satisfied by empowering, strengthening, and connecting them [20].

Hypothesis 1 (H1): An individual`s self-determined motivation has a positive effect on digital competences in the context of digital transformation.

C. *Independent variable: Innovation adaption*

Diffusion of Innovation theory (DOI) as social science theory explains the spreading of innovation over time as a process [5], individuals and their perceptions of technology and processes are decisive. According to DOI, the stages of adoption depend on five perceived attributes (relative advantage, compatibility, complexity, trialability and observability).

DOI was developed to describe the stages of how an innovation spreads over time, diffusing as a process. These aspects are antecedents to categorising users and their tendency to adopt innovation. The categorised groups (innovators, early adopters, early majority, late majority and laggards) are important to differentiate for organisations to develop strategies on how these personalities can be targeted [21]. We assume that the perceived attributes of innovation are relevant antecedents for the willingness of individuals to acquire digital competencies to work with new technologies and digital processes.

Hypothesis 2 (H2): Individual innovation adoption positively affects digital competencies in the context of digital transformation.

D. *Mediating variable: Digital competence*

Knowledge and competence affect employees´ confidence in digital technology [22]. As digital competencies enable employees to participate actively in a digitalised environment [23], organisations need to identify their employees' existing and required competencies and develop solutions to transform their human capital, adapting to changing technologies [24].

There are recommendations and initiatives from the European Union that emphasize the scope and importance of key competencies for all citizens in the private sphere, in the labour market and for the economy. In their council recommendations, the EU suggests their member states foster these key competencies, defined as "a combination of knowledge, skills and attitudes" for lifelong learning [25]. Based on this, the European Commission developed a digital competence framework for citizens (DigComp), including the competence areas of communication, networking, digital literacy, security and content development [26] with knowledge, skills and attitudes illustrating each competence.

This research paper wants to shed light on the antecedents to transform human capital on the individual level. Therefore, it focuses on digital competencies by adopting the DigComp framework. We assume digital competencies are fundamental for learning in digital transformation.

Hypothesis 3 (H3): Digital competencies mediate the effect of motivation and innovation adoption on learning.

According to this theoretical framework, we developed and quantitatively tested the constructed model as displayed in Figure 1.

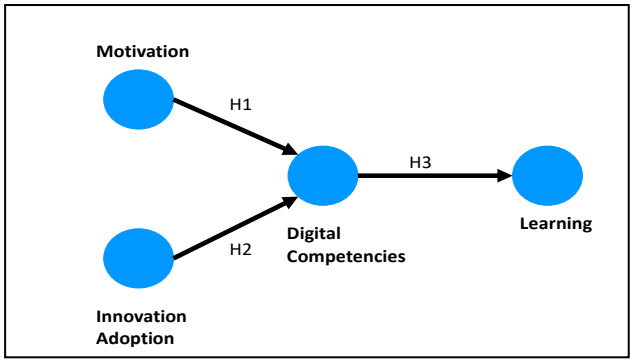

Figure 1. Constructed model

III. METHODOLOGY

Five variables were defined based on existing research and theories, and a conceptual model was developed. A questionnaire was designed to test this model, asking for personal and organisational information in addition to items and measurements applied in previous studies [27] . The hypothesis and measures were tested using a questionnaire on LinkedIn and Prolific platforms. Those platforms allow directly access working professionals across industries in digitally impacted roles, offering controlled diversity and reducing selection bias. Since different scales were used to avoid common method bias (5-point Likert scale for digital competencies, 7-point Likert scale for other items), the statistical analysis in the software Smart PLS were calculated with standardized data.

Variables

Items to measure organisational learning are adopted by Arranz et al. [28], measuring knowledge resources as the main input for innovation. Items for individual learning were adapted from Lee et al. [29], measuring students' behavioural and cognitive learning factors. These items adequately measure the desired outcome, as organisational and individual learning result from individual behaviours and their ability to explore, detect, and solve problems, and the organisation's ability to change established routines and perform in new digital environments [30].

The independent variables are based on established scales. Self-determination motivation items were developed based on the Basic Needs Scale [4], which was adopted in previous studies [31]. This scale measures the dimensions of autonomy, competence and relatedness. To measure innovation adoption, the items were developed based on Roger´s Diffusion of Innovation theory [5], which was widely applied in this research field to test innovation adoption [32].

The items in the survey measure the five perceived attributes of relative advantage, complexity, compatibility, trialability, and observability, which are accepted in research as technological antecedents for innovation adoption on the individual level [33]. The possible mediator, digital competence, is composed of the level and importance of the dimensions, since the European Commission emphasises both [34]. Items measuring the level of competencies are based on the competence areas developed by the DigComp framework, in combination with attitudes towards learning as an appropriate measurement in the human-centred approach [35]. In addition, the importance of digital competencies is measured based on the O*net program [36], which aims to investigate and provide information about the competencies in the labour market that impact the U.S. economy. This database and its measures are established and widely applied to investigate the needs of organisations and employees [37].

Survey Design

The questionnaire comprised 52 questions in English and was translated into German (can be provided with a separate Appendix). It was distributed as a survey in both languages via "LinkedIn" to reach an appropriate sample of employees with basic digital capabilities and extended with participants completing the questionnaire in English by a collector using the online platform Survey Monkey. Participants were asked to pass on the survey link by sharing it on social networks or directly. This purposive sampling is a commonly used approach in research [38]. The survey was also placed via the platform "Prolific" to expand the range of responses. Prolific is a marketplace for online survey research, which is applied in other research on digital transformation in healthcare [39]. The tools SmartPLS 4 and Jamovi were used to analyse the gathered data.

IV. RESULTS

The survey received responses from 152 participants: 126 in English and 26 in German. Fifty-two per cent of the respondents are female, 47 per cent are male, and 1 per cent are diverse. Most participants are employees (25%) or seniors / experts (27%); 23 per cent hold management positions. Forty per cent are aged 41 and above, while the majority of participants (47%) are aged between 25 and 40. To analyse the data, the software Jamovi and Smart-PLS was used. First, the variance was tested with principal component analysis in Jamovi. The resulting 25% variance is below the threshold of 50%, indicating that the item characteristics differ [40]. Based on this result, common method bias is not prevalent in this study. PLS-SEM is an appropriate tool for multivariate analysis and is widely used in business research [41]. Since all items are based on constructs applied in other contexts, Exploratory Factor Analysis and Confirmatory Factor Analysis were performed in Jamovi as a first step in constructing the model.

Outer Model results

Confirmatory factor analysis was applied in Jamovi based on the created subdimensions to investigate the model fit (Table 1).

RSMEA < .05 indicates a good, < .08 a reasonable and over 0.1 a poor model fit, chi-square represents the difference between the expected and observed data (chi-square 0 = expected and actual data are equal), a lower chi-square represents a good model fit. The results are presented in Table 1, the chi-square test indicates no exact fit, RSMEA indicates a reasonable model fit.

Cronbach´s alpha for all variables is > 0.7, for convergent validity, average variance extracted (AVE) should be > 50%, which is also reached, so internal consistency and item reliability are given [42]. The results are displayed in Table 2.

TABLE I. CONFIRMATORY FACTOR ANALYSIS

Fit measure	**Test for exact fit**		
RMSEA	X^2	*df*	*p*
0.0782	1700	881	<.001

a. Indicators analysed in Jamovi
b.

TABLE II. OUTER MODEL INDICATORS

Variables	Outer Model Indicators			
	Cronbach´s alpha	*Average variance extracted (AVE)*	*Composite reliability (rho_a)*	*Composite reliability (rho_a)*
Motivation	0.800	0.458	0.811	0.854
Innovation Adoption	0.870	0.404	0.887	0.894
Digital Competence	0.900	0.420	0.907	0.915
Learning	0.788	0.476	0.820	0.842

c. Indicators analysed in Jamovi

TABLE III. INNER MODEL RESULTS

Construct	Construct			
	Digital Competence		*Learning*	
	Path co-efficient	*P-Value*	*Path co-efficient*	*P-Value*
R^2	**0.534**		**0.515**	
Motivation	0.156	0.088		
Innovation	0.601	0.000		
Digital Competence			0.781	0.000

d. Indicators analysed in Jamovi

Inner Model results

R2 measures the extent to which the dependent variable is predicted by the independent variables, with values above 0.75 described as substantial, 0.5 as moderate, and 0.25 as weak [41]. The inner model results are displayed in Table 2.

The moderating variable digital competencies can be predicted to be 53% by both independent variables: motivation and innovation adoption. The constructed model demonstrates good predictive power for the outcome variable learning (51%). The path coefficient of 0.601 supports the hypothesised relationship between innovation adoption and digital competencies (H2) and is statistically significant with a p-value of 0.000. The relationship between motivation and digital competencies (H1) is weaker (0.156) and not statistically significant (p-value of 0.088). The hypothesised positive effect, moderated by digital competencies on learning (H3), is also supported (path coefficient of 0.718 / p-value of 0.000).

V. DISCUSSION

Digital transformation massively impacts the labour market. Previous research focuses on the benefits of increasing the efficiency of processes and cost-containment measures, emphasising potential barriers to successful implementation [39]. Dynamic capabilities theory is widely used as a theoretical framework for digital transformation. However, building advantages and withstanding in rapidly changing digital environments requires individual participation. Knowledge, skills and competencies are often mentioned synonymously in recent papers [43]without a clear definition or distinction. Competence and learning are emphasised as inevitable digital transformation prerequisites, but concrete concepts and measurements are rare.

In this study, we aimed to provide clear definitions, examine the assumed effects of motivation and innovation adoption on individual-level digital competencies, and investigate the impact of organisational learning and the significance of digital competencies as contextual factors. The developed measures are internally consistent and reliable, as demonstrated by the analysis of the outer model.

The inner model analysis highlights the assumed relationship between motivation, innovation adoption, digital competencies, and learning. The results align with other studies. Talwar et al. [44] display the importance of engaging and motivating all stakeholders since digitalisation strategies may fail due to reluctance to adopt innovation. Companies need to reconfigure and encourage employees to be innovative [45].

The insignificant relationship between self-determined motivation and digital competence contradicts our assumption that intrinsic motivation is a key driver for learning and skill acquisition. Other factors, such as external requirements for using technology, are more relevant to developing digital skills than one's own motivation. External triggers, like mandatory use and exposure to technology might override internal drivers. Motivation types should be investigated more deeply to explore interactions with contextual enablers, such as training availability or technological pressure.

The variable of digital competence significantly impacts learning. Overall, the developed construct provides evidence for the hypothesised mechanisms. According to the Exploratory Factor Analysis results and the rejected relationship between motivation and the development of digital competencies, a need for deeper investigation into these relationships and improvement of the constructs arises. These results are a building block for further in-depth research, reworking the questionnaire to enhance comprehensibility. Future studies could explore the potential moderation of factors like age or ease of use on the willingness to adopt new technology.

VI. CONCLUSION

Digital transformation disrupts workplaces, and employees must be prepared to use digital technology confidently and be open to innovation. We investigated the effects and relationships of motivation, innovation adoption, digital competencies, and learning as relevant factors in digital transformation and showed that digital competencies are gaining more importance in legislation to enable citizens to participate in the change. For organisations, it is indispensable to adopt and transfer these efforts. Transforming their current human capital towards new knowledge and mindsets with

sustained learning is the most relevant dynamic capability in digital transformation.

The study makes several contributions. First, it enhances knowledge by testing the Self-Determination Theory in digital work environments. Contrary to theoretical assumptions, the findings indicate that motivation alone is insufficient to foster the development of digital competence. External factors, such as organisational requirements and environmental conditions, appear to be more influential. Second, the study extends the Diffusion of Innovation Theory by introducing digital competencies as a mediating variable, emphasising that competence acquisition is critical for successful digital transformation. Third, it proposes that sustained learning should be regarded as a dynamic capability; organisations must navigate digital transformation effectively as a significant aspect of organisational adaptability. This finding expands dynamic capabilities theory by recognising learning as an ongoing capability that enables organisations to integrate, build, and reconfigure their competencies in response to evolving digital environments.

It has practical implications and advises managers on integrating employees and designing training methods, allowing for independent content development along with straightforward access and testing options.

This study has its limitations. Since the aim was to test the developed measures and the construct, it was placed on social media for convenient access. The sample size of 152 does not allow generalisation of results, but it is suitable for obtaining feedback and improving the questionnaire. The result might be biased due to the author's social network, which mainly comprises individuals working in educational contexts or healthcare. Further research should investigate the learning factor as a new concept, develop adequate measurements, and raise the question of whether digital competence is an outcome of deliberate learning or functional adaptation.

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