Journal of Business Management, Volume 23, 2025, ISSN 1691-5348
DOI: 10.32025/JBM25002

IMPACT OF DIGITAL COMPETENCIES ON ORGANISATIONAL LEARNING

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ABSTRACT

Purpose Digital transformation affects almost every company and its employees. Tasks are changed and even completely new jobs are created. This disruptive incident on workplaces with a mismatch between current knowledge of workforce and new digital competencies might be compensated through organisational learning. However, there is no sufficient knowledge about the mechanism, on how and to what extent the level, willingness to increase digital competencies and their importance for the task causes organisational learning.

Design/ methodology/ approach This study aims to test the effect of digital competencies on organisational learning to adapt and reallocate resources in digital transformation. A questionnaire was designed and distributed in social media. Structural equation modelling (PLS-SEM) and Necessary condition analysis (NCA) were applied to empirically test the gathered data.

Findings The perceived importance of digital competencies positively affects the self-assessed level of competencies and impacts the participants willingness to increase this level. Employee's willingness to build or increase their level of digital competencies are a necessary, but not sufficient condition on a high level of organisational learning.

Research limitations The sample size is small for generalisable results. Future research is needed with large samples.

Practical implications Digital competencies are relevant and must be considered for organisational learning in the ongoing transformational process.

Originality/value Organisational learning is complex and happens on different levels. Since competencies of employees are known as relevant part of organisational learning, there is need for more knowledge about the mechanisms to adjust human resources.

Keywords Digital competencies, Organisational learning, Digital transformation.

Type of the paper: M10 General

Citation:

Starke, S., Ludviga, I. (2025). Impact of digital competences on organisational learning. *Journal of Business Management*, Vol. 23. DOI: 10.32025/JBM25002

Received: 30.07.2025.

Accepted for publication: 19.12.2025.

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INTRODUCTION

Digital transformation as a disruptive phenomenon causes uncertainty. An organisational strategic reaction is to adjust and reconfigure human resources, building relevant knowledge and competencies (Ivaldi, Scaratti and Fregnan, 2022). Previous research highlights the importance of new competencies and organisational learning in digital transformation (Dörner and Rundel, 2021), the majority of these studies focus on learning concepts to apply specific digital technologies to the task (Gardner, 2022). The ongoing digital transformation is reshaping education and learning, thereby placing increasing emphasis on the acquisition of new competencies (Suessenbach *et al.*, 2021; Gilli, Lettner and Guettel, 2023). A deeper understanding of the mechanisms to improve organisational learning in digital transformation is needed, integrating individuals with their attitudes and mindsets towards building fundamental digital competencies.

Current research highlights the complexity of digital transformation with potential benefits on the one hand, but uncertainty about the realisation of these benefits concerning necessary investments in technology and knowledge and adaptation of individuals (Colli, Stingl and Waehrens, 2022). Perceptions of individuals are of high importance for the learning process; a change in work habits needs a framework and guidance (Bandura, 1988). Argyris and Schön highlight the relevance of a double-loop learning process, questioning underlying assumptions and changing habits and routines (Argyris, 1997) for the most effective organisational learning. Employees` perceived self-efficacy and their willingness to develop new competencies emerge as relevant building blocks of unlearning outdated work routines and relearning for new digital workplaces. These aspects contribute to enhancing organisational learning as a strived outcome in digitally transformed environments (Starbuck, 2017). Based on this, a mismatch between current work routines and knowledge of established processes occurs when digital transformation happens and turns all known processes and habits upside down. Due to that, this research paper aims to investigate the effect of the self-assessed current level of digital competencies, the willingness of employees to increase this level and the importance of this level for the job task on organisational learning.

For the research purpose of testing the assumed effect, a survey was conducted as a quantitative approach, and the collected data were analysed to investigate applying structural equation modelling.

The study adds new knowledge to organisational learning theory by empirically testing how employees' digital competencies impact organisational learning and adaptation in a digitally changed workplace and identifying DC as a necessary condition for organisational learning.

The findings point out the high relevance of the individual perceptions about digital competencies, with a direct influence of the perceived importance of competencies on the self-assessed competence level and the willingness to increase this level. The current level of digital competencies of participants was assessed as relatively high and does not cause an increase in organisational learning. The importance of digital competencies and the willingness to uplevel these competencies are necessary conditions for a high level of organisational learning.

This paper presents the theoretical background with the derived hypothesis in the first chapter, provides a brief methodological overview in the second chapter, then discusses the results in chapter three and concludes with recommendations for further research in chapter four.

THEORETICAL BACKGROUND AND HYPOTHESES

Industry 4.0 is characterised by digital transformation. To succeed in digital transformation and to sustain this ongoing process of fundamental changes, there is a need for further investigation into developing new capabilities (Warner and Wäger, 2019) to be resilient and adaptable. Organisational resilience was investigated in previous research as a dynamic capability in the context of digital transformation and the COVID-19 pandemic (Forliano *et al.*, 2023). Organisational learning, or learning in organisations, was investigated as an essential element of resource-based management to perform in digital environments through knowledge and competence (Do *et al.*, 2022). Learning enables organisations to adapt to rapidly changing conditions (Starbuck, 2017). Fiol and Lyles (1985) define organisational learning as "…the process of improving actions through better knowledge and understanding". Consequently, learning serves as a suitable construct to conclude the resilience of organisations and employees in digital transformation.

Organisational learning enables firms to develop a basic dynamic capability to adapt to the change process, reconfigure human capital, provide guidelines, and foster new, relevant competencies with a culture of experimentation (Teece, 2007). Organisational learning theory suggests that firms can improve future performance through knowledge and better understanding, allowing organisations to align with their environment, remain competitive and innovative (Fiol and Lyles, 1985). Digital transformation challenges firms due to the complexity and the uncertain opportunities or risks of failure; they need to question established structures, routines, and identify and develop new competencies (Dogan, 2017). However, organisational learning theory is critically discussed due to the fragmentation of the research. Several aspects are investigated across various fields of science and at different levels. Still, there is no approach to overlay these different perspectives and develop concepts to derive actions for adapting to disruptive changes (Lähteenmäki, Toivonen and Mattila, 2001).

Organisational learning is identified as the relevant capability of an organisation to acquire and transfer knowledge, resulting in collective learning and changes on an organisational level (Crossan, Lane and White, 1999). There is still insufficient knowledge of the mechanisms of how and to what extent individual competencies and willingness to learn affect this organisational learning capability (Alerasoul *et al.*, 2022). Previous research indicates that organisational learning occurs as result of an incident or failure (Learn, 1977; Fiol and Lyles, 1985; Easterby-Smith, Crossan and Nicolini, 2000). It remains indistinct whether the changed workplace context, integrating new technologies with the need for digital competencies, leads to organisational learning. There is a need to further explore the impact of digital competencies on organisational learning in the context of digital transformation.

Employees are essential to any economy and organisation as human capital (Goldin and Katz, 2009). The development of digital competencies, knowledge management, and deployment to

work with advanced technologies poses a new challenge. The European Commission developed a digital competence framework for citizens (DigComp), which defines a relevant set of knowledge, skills, and attitudes (European Commission *et al.*, 2022).

If employees possess high levels of digital competencies, they have valid information and can better adapt to changes. As digital transformation causes learning, it can be assumed that the level of digital competencies drives a shift in established routines and triggers organisational learning (Dörner and Rundel, 2021).

H1: The level of employee digital competencies positively affects organisational learning.

Digital competencies are essential in digitally transformed workplaces (Council of the European Union, 2018). There is pressure for employees to increase their competency levels to master new digital tasks (van Laar *et al.*, 2020).

H2: The perceived importance of digital competencies is positively affecting the level of employee digital competencies.

H3: The perceived current level of digital competencies is strongly related to the willingness to increase them.

Learning processes happen when existing routines or habits no longer work and result in failures (Argyris, 1997). It is assumed that the changing situation, requiring new competencies, leads to a learning process.

H4: The perceived importance of digital competencies is positively influencing the willingness to increase the competency level.

Since digital competencies are essential for success in digital workplaces, there is pressure to adjust and maybe even to question governing conditions and assumptions of organisations to induce the change process (Learn, 1977).

H5: The perceived importance of digital competencies is positively affecting organisational learning.

H6: The willingness to increase digital competencies impacts organisational learning.

Figure 1 presents the conceptual model of the research variables and hypothesised relationships.

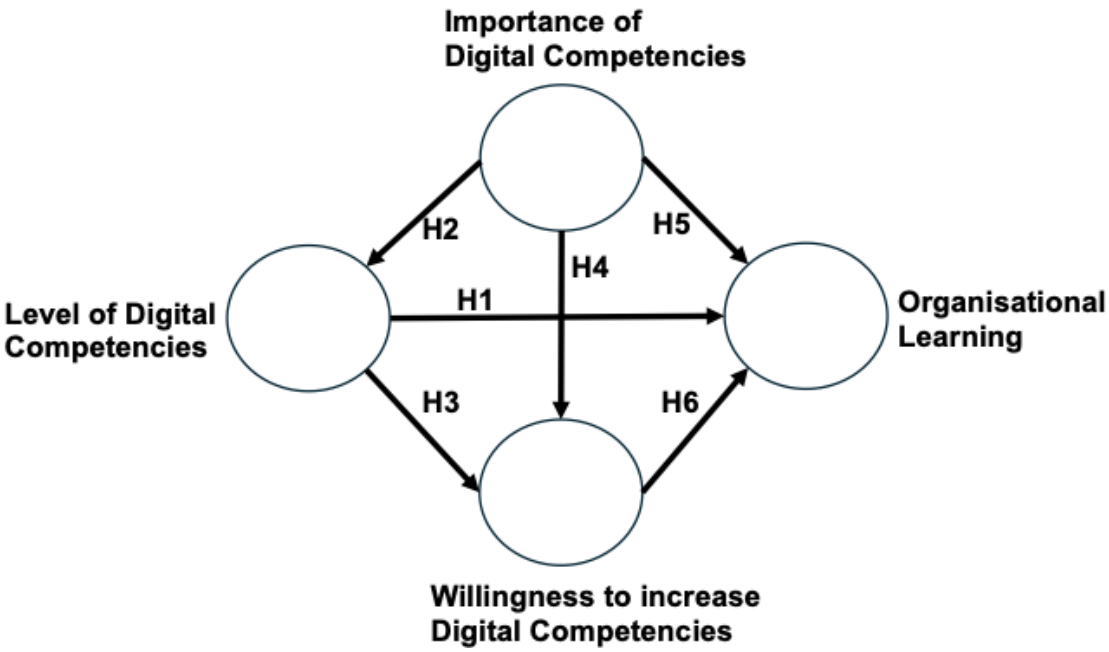

Figure 1. **Conceptual model**

RESEARCH DESIGN AND METHODOLOGY

This study investigates the effect of digital competencies on organisational learning in response to the disruptive changes in digital transformation.

Building on established theoretical foundations, the variables were operationalised to enable an empirical test of the proposed model.

The questionnaire was developed using measurement items that have been validated in prior research. Socio-demographic factors such as position, tenure, gender and age were collected as additional information. The questionnaire was distributed as a survey to test the hypotheses and the constructed model on social media via LinkedIn. The data were analysed by applying partial least squares structural equation modelling (PLS-SEM) and necessary condition analysis (NCA). PLS-SEM was used to test the hypothesised causal relationships between the constructs. Since organisational learning processes are often complex and non-linear, Necessary Condition Analysis (NCA) was additionally applied to identify such bottleneck conditions that must be present for high levels of organisational learning to occur (Field, 2020; Ofori, 2024). Combining PLS-SEM and NCA thus enables a comprehensive practical understanding by identifying the combination of factors that leads to the best organisational learning outcome. (Drejer, 2000; Richter *et al.*, 2020).

Variables

The items to measure the dependent variable, organisational learning (OLEAR), were developed based on the work of Arranz et al. (2019), investigating organisational knowledge resources. These measures are suitable as long as organisational learning develops or reconfigures knowledge resources to be resistant and act in the digital transformation. For example, the adaptability of organisations to changing technology and workloads was asked in

the following question: “In my opinion, the company I am currently working for can easily react by adequately adapting technologies to target the wishes of customers or to relieve employees from heavy workload”.

The three independent variables, importance (ICOMP), level (LCOMP), and willingness to increase digital competencies (WCOMP), are based on the competence areas developed by the DigComp framework as an appropriate measurement in the human-centred approach (Biggins *et al.*, 2017). The perception of participants about the importance of digital competencies (ICOMP) was measured based on established scales applied by the O*net program (National Center for O*NET Development by the U.S. Department of Labor, 2023). As a sample item, the importance of data literacy was asked: “How important is it to your current job that you can search for information online and can work with this data?” This program regularly evaluates the development of human capital competencies. The variable LCOMP measures the level of competencies in information & data literacy, communication & collaboration, creating digital content, problem-solving, and digital security knowledge, based on participants' self-assessments. Sample item is “What level of competency do you think you have using digital communication tools and collaboration platforms?”. The variable WCOMP measures the exact dimensions, asking participants to rate their willingness to increase their digital competencies in these five areas for the job. For example, “To what extent are you willing to increase your competency to create and edit digital content?”

Research design

This study applies a quantitative method, which is commonly used due to its rigour and the approved steps for validity and reliability (Christensen, Johnson and Turner, 2021). Measurement errors could threaten the validity of research findings, and method biases can harm the observed relationships between variables (Podsakoff *et al.*, 2024). To avoid common method bias (CMB), efforts were made to achieve a methodological separation. To address issues caused by the rating source or measurement context, the study was separated into two groups: the first was reached through social media, and the second was administered using a different medium and addressed experienced raters. To avoid problems associated with item characteristics, the measures of dependent and independent variables were separated using different scales (5-point Likert scale for ICOMP, LCOMP and WCOMP; 7-point Likert scale for OLEAR), placing socio-demographic questions in between (Podsakoff *et al.*, 2003). As a post-hoc measure, Harman´s single-factor test (HSF) was used. This analysis assumes that the manifestation of a single dominant factor points to the presence of CMB. To test HSF, an exploratory factor analysis is conducted. All items are summarised into one single factor, and the percentage of variance in the total of this factor is compared against the threshold of 50% (Podsakoff *et al.*, 2024). An exploratory factor analysis was conducted in Jamovi. The factor summary accounts for 29% of the variance. Since this value is < 50%, CMB is not present.

The pilot questionnaire was developed in English, translated into German and distributed in both languages as a survey via the social network “LinkedIn” to reach an appropriate sample of employees with basic digital competencies. In a snowball sampling, the participants were asked

to pass on the survey. 52 people participated in this first step. In the next step, additional data from 100 responses of a panel were gathered, using the platform SurveyMonkey.

RESULTS AND DISCUSSION

The questionnaire was completed by 152 participants in total, 52% female, 47% male, 1% divers. For data analysis, PLS-SEM, as an appropriate and widely applied method for multivariate analysis (Hair, Ringle and Sarstedt, 2011), was applied, using the software Smart PLS 4. For descriptive statistical analysis, the software Jamovi was used.

Descriptive statistics

All dimensions of digital competencies were measured on a 5-point Likert scale. There is no gender-specific difference in self-reported digital competencies; men just slightly rate their competency level and the importance of digital competencies higher than other participants (Table 1).

Table 1. **Descriptive statistics: Digital competencies split by gender**

	Gender	Level of dig. comp	Import. of dig. comp.	Willingness to increase
N	Female	79	79	79
	Male	71	71	71
	Divers	2	2	2
MEAN	Female	3.66	3.58	3.70
	Male	3.80	3.97	3.70
	Divers	3.50	3.50	3.70
MEDIAN	Female	4	4	4
	Male	4	4	4
	Divers	3.50	3.50	3.50

68 % of the participants are aged 41 and above. The self-assessed level of digital competencies and the perceived importance increase from age 31 onward. The willingness to increase digital competencies is quite similar across all age groups (Table 2), with slightly lower levels among younger and older participants.

Table 2. **Descriptive statistics: Digital competencies split by age**

	Age	Level of dig. comp	Import. of dig. comp.	Willingness to increase
N	< 25	19	19	19
	25-30	27	27	27
	31-40	45	45	45
	41-50	43	43	43
	51-60	15	15	15
	> 61	3	3	3
MEAN	< 25	3.05	3.93	3.37
	25-30	3.56	3.66	3.62
	31-40	3.77	4.07	3.77
	41-50	4.43	4.07	3.77
	51-60	4.20	4.00	3.87
	> 61	4.20	2.79	3.33
MEDIAN	< 25	3	3	3
	25-30	4	4	3.5
	31-40	4	4	4
	41-50	4	5	4
	51-60	4	5	4
	> 61	4	4	3

Organisational learning was assessed on a 7-point Likert scale. 36% of the participants work for small or medium-sized companies with fewer than 50 employees (one participant did not respond to the question about organisational size).

Table 3. **Descriptive statistics: Organisational learning split by company size**

	Organisational size	Organisational learning
N	< 10	22
	10-49	32
	50-249	42
	> 250	55
MEAN	< 10	4.05
	10-49	4.53
	50-249	4.56
	> 250	4.45
MEDIAN	< 25	4
	25-30	4
	31-40	4
	41-50	4

Overall, the perceived level of organisational learning in the companies is moderate; neither very high nor very low, with a tendency towards the centre (Table 3).

Outer model results

In the reflective model, the indicator and internal consistency reliability are assessed first, followed by construct validation with convergent and discriminant validity (Hair *et al.*, 2021). Indicator reliability examines the extent to which the indicator´s variance is explained by its construct. Item loadings should be above the threshold of 0.708, but weaker indicator loadings should be deleted only if this would increase internal consistency reliability or convergent validity (Hair *et al.*, 2021). Internal consistency displays the extent to which indicators measuring the same construct are associated with each other. For internal consistency, Cronbach´s alpha should meet the threshold > 0.7 (Hair *et al.*, 2021). All indicators meet the threshold; therefore, reliability is given.

Convergent validity is the extent to which the measurements are suitable, explaining the variance of their indicators. The average variance extracted (AVE) is used to evaluate convergent validity (Hair, Ringle and Sarstedt, 2011), with a threshold of > 0,5. All outer loadings, except the importance of content creation (0.597), meet the threshold of > 0.708.

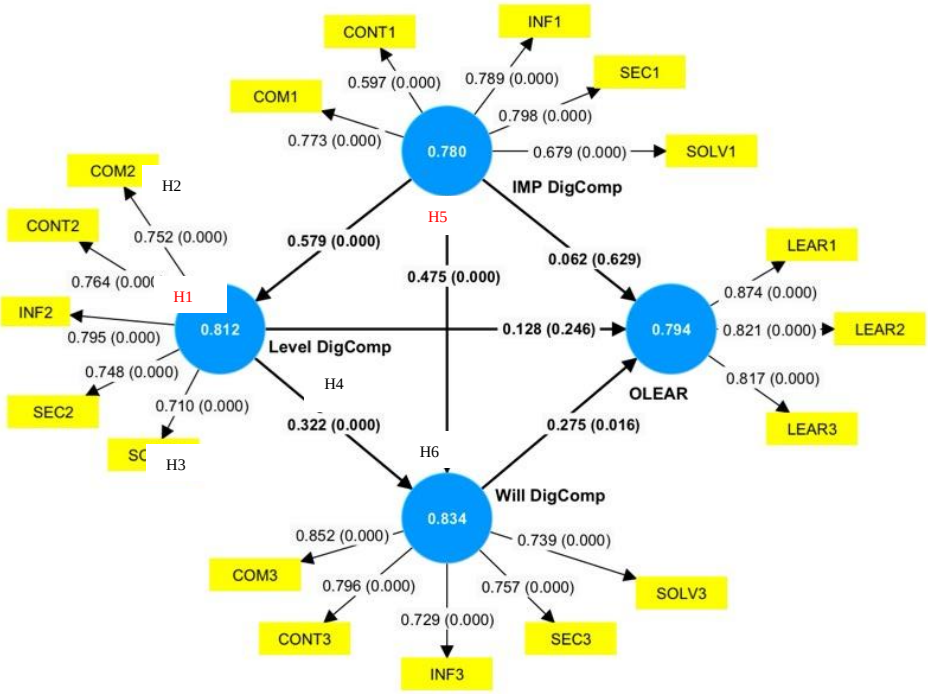

Figure 2. **Outer model results and factor loadings**

Since the AVE for this construct is above the threshold of 0.5, all items remain unchanged. Table 4 displays internal consistency and convergent validity for all factors.

Table 4. **Indicator reliability**

Construct	Cronbach´s alpha	Average variance extracted
ICOMP	0.780	0.535
LCOMP	0.812	0.569
WCOMP	0.834	0.602
OLEAR	0.794	0.702

Inner model results

In the next step, path coefficients and the model's significance are evaluated. This model shows only weak predictive power for organisational learning (R^2 = 0.169). If we first consider the path coefficients between the independent variable dimensions of digital competencies, the following emerges. The perceived importance of digital competencies has a significant positive impact on the level of competencies (H2) and the participant`s willingness to increase them (H4). The self-assessed level also directly affects the participants´ willingness to increase their digital competencies. H3 is approved as well, but the path coefficient is weaker. The importance of digital competencies for the job, the existing level, and the willingness to increase this level are linked.

Table 5. **Inner model results**

Path	Path coefficient	P-value	R^2
OLEAR			0.169
LCOMP → OLEAR	0.128	0.246	
ICOMP → LCOMP	0.579	0.000	
LCOMP → WCOMP	0.322	0.000	
ICOMP → WCOMP	0.475	0.000	
ICOMP → OLEAR	0.062	0.629	
WCOMP → OLEAR	0.275	0.016	

Regarding the effect on the dependent variable OLEAR, it becomes clear that the current level (H1) and perceived importance (H5) have no statistically significant impact on organisational learning. Only the willingness to build or increase digital competencies (H6) appears to affect the organisational learning (H6) at a 5% significance level; the path coefficient shows only a weak effect.

Previous research highlights competence development as a precursor to organisational learning (Takahashi, 2017; Do *et al.*, 2022; Ivaldi, Scaratti and Fregnan, 2022), which appears

to be dismissed in these results. Since the theoretical argumentation in these studies is reasonable, necessary conditional analysis (NCA) was applied in the next step.

NCA is a suitable method to complement the PLS-SEM analysis for further investigations of the dataset and examination of variables that need to be present to a certain extent, providing a better understanding of how different variables should be combined (Dul, 2016).

A necessary but not sufficient condition of an independent variable claims that high values of the outcome variable are only possible (but not guaranteed) with high levels of the independent variable (Dul, van der Laan and Kuik, 2020). The NCA analysis displays the spread of observations (Tynan, Credé and Harms, 2020).

Ceiling Envelopment – Free Disposal Hull (CE-FDH) technique was used, which is appropriate for discrete data, where all observations are below the drawn ceiling line (Tynan, Credé and Harms, 2020). Table 6 provides an overview of the bottleneck table. For a high level of organisational learning (90%), a minimum level of digital competencies equal to 49% and willingness to increase digital competence equal to 62% is necessary.

Table 6. **Bottleneck table CE-FDH percentiles**

	LV scores OLEAR	LV scores ICOMP	LV scores WCOMP	LV scores LCOMP
0 %	-2.520	0.000	0.000	0.000
10%	-2.066	0.658	0.000	0.000
20%	-1.611	0.658	0.000	0.000
30%	-1.157	1.316	1.974	0.000
40%	-0.703	1.316	1.974	0.000
50%	-0.249	1.316	1.974	0.000
60%	0.206	1.316	3.289	3.947
70%	0.660	1.316	13.816	3.947
80%	1.114	16.447	26.974	7.237
90%	1.569	16.447	61.842	49.342
100%	2.023	16.447	80.921	67.105

A minimum of d > 0.1 is suggested as a threshold (Dul, 2016) for a necessary condition to be meaningful. Following this, the effect sizes (d) of importance and level of digital competencies are small (ICOMP d = 0.183; LCOMP d = 0.196), whilst d for willingness to build or increase digital competencies can be considered as medium (WCOMP d = 0.350).

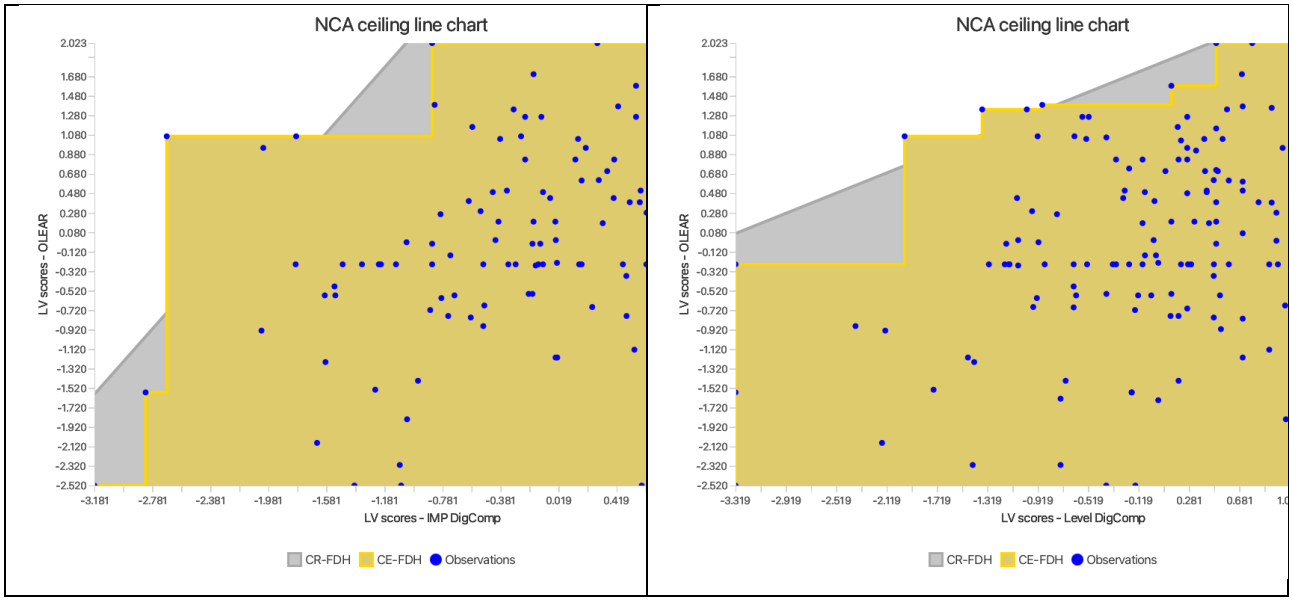

Figure 3. **Ceiling line charts importance & level of digital competencies on organisational learning**

This is graphically displayed in the NCA ceiling line chart, where there is no meaningful empty space in the upper corner of the scatterplot.

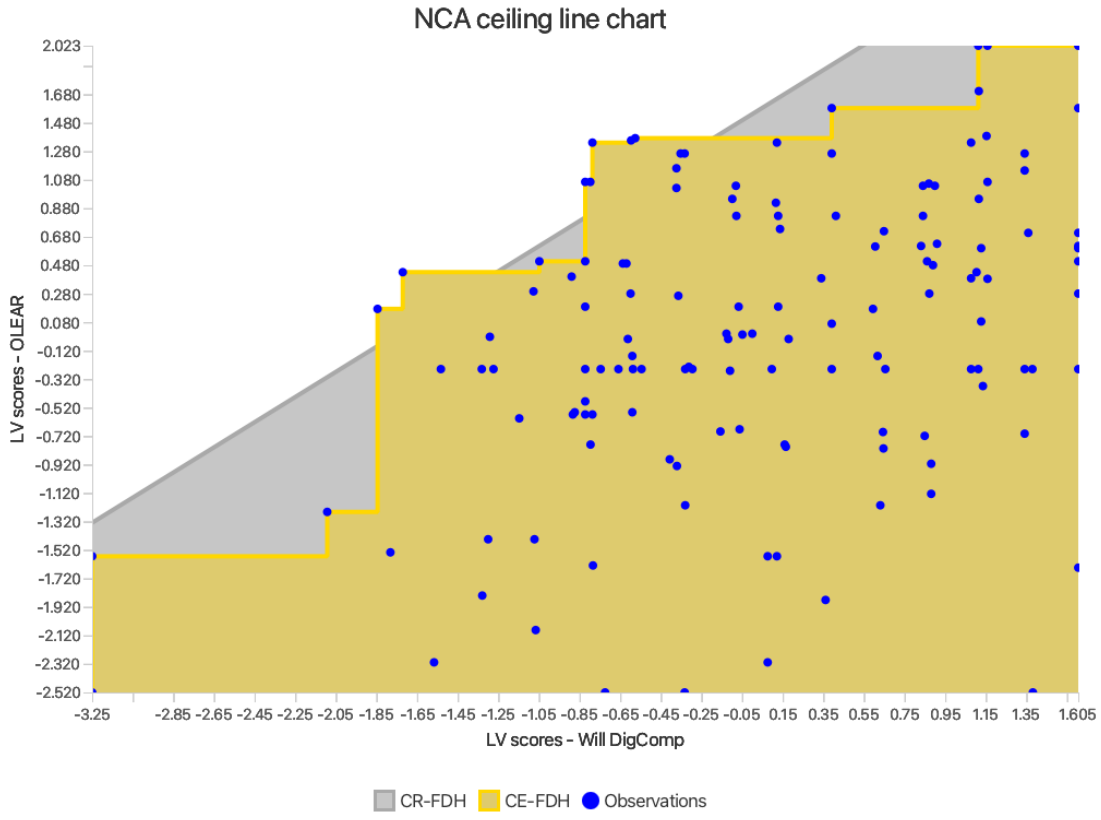

Figure 4. **Ceiling line chart willingness to increase digital competencies**

The degree to which the independent variable is necessary but not sufficient for the dependent variable is represented by this empty space. The significance of a certain level of digital competencies is observed as a necessary condition with a small effect size. The scatter plots display the ceiling lines, separating observed data from the area without observations in the upper corner. The lack of empty space shown in Figure 3 indicates that the level of digital competencies is a less limiting factor for organisational learning compared to the importance of digital competencies for the job. In contrast, the ceiling line chart of the latent variable willingness to increase digital competencies (Figure 4) displays a greater space without observations. The willingness of employees to build or increase their competence level appears to be a necessary condition for organisational learning.

Discussion of results

Argyris and Schön (1996) introduced the concept of organisational learning, which arises from an incident or mismatch with the need for actions to adjust (Patterson, Nurse and Franqueira, 2024). Since digital transformation fundamentally changes workplaces with new processes and technologies, organisations need to learn and adapt. The models of single-loop and double-loop learning by Argyris and Schön remain the most prominent, but there is still limited quantitative research. Due to the underdeveloped measures, organisational learning theory remains vague and overarching frameworks for organisations are absent (Starkey, 1998; Lähteenmäki, Toivonen and Mattila, 2001). These concepts and frameworks are needed to guide organisations and managers in addressing the challenges and growing uncertainty in new work tasks (Senge and Sterman, 1992).

However, current research does not provide sufficient knowledge about the effects of employees' digital competencies on organisational learning in digital transformation. This research empirically investigated the effect of three dimensions of digital competencies (level, importance, and willingness to increase) on organisational learning to better understand these mechanisms to improve organisational learning in digital transformation. The findings indicate that the perceived importance of digital competencies positively affects employees' self-assessed competency levels. Based on this perceived level of digital competencies, organisational learning is impacted. If digital competencies are important for the job, employees report an increased willingness to develop or increase competencies as a necessary condition for organisational learning. Various studies highlight the impact of employees' competencies on organisational learning in digital transformation (Takahashi, 2017; Dörner and Rundel, 2021; Ivaldi, Scaratti and Fregnan, 2022). Despite this relevance, there may be a mismatch between traditional capabilities and the new digital competencies required (Goulart, Liboni and Cezarino, 2022; Gilli, Lettner and Guettel, 2023). These results emphasise both the complexity of the mechanism and the need to further explore the various dimensions of digital competencies.

Organisational learning tends to be expandable within the companies the participants work for (Mean 4.278 on a 7-point Likert scale). Digital competencies are perceived as highly important in digital transformation. The competency for information & data literacy appears most

important (Mean 4.596 on a 5-point Likert scale), which aligns with previous research that posits independent knowledge acquisition by employees as a relevant precondition for digital change (De Vries, Bekkers and Tummers, 2016). All measured indicators are internally consistent and reliable, as proved by the analysis of the outer model. All the hypotheses estimating a positive effect of digital competencies on organisational learning were rejected, as the p-values showed no statistical significance, except for the willingness to build or extend the current competence level. However, the model points to relevant indirect relationships. The perceived importance of digital competencies influences organisational learning indirectly through the competence level and the willingness to increase competencies. This aligns with organisational learning theory, which emphasises that it is not merely existing competence levels that matter, but rather the willingness to develop new skills triggered by perceived relevance (Takahashi, 2017; Dörner and Rundel, 2021). Empirically, both the PLS-SEM and the NCA results support this interpretation. High levels of perceived importance and willingness represent necessary, though not sufficient, conditions for organisational learning. Theoretically, this highlights that organisational learning is driven by employees' readiness to adapt and engage in continuous learning. Although the structural model was developed with direct paths between the variables, the results and theoretical reasoning suggest that indirect or mediated relationships exist. In particular, the perceived importance of digital competencies appears to indirectly influence organisational learning by affecting both competency levels and the willingness to increase them. Hence, while our model statistically focused on direct effects for parsimony and reducing the complexity, the interpretation acknowledges underlying mediating mechanisms consistent with organisational learning theory.

A deeper investigation with NCA reveals a significant effect size of the willingness to increase digital competencies on a very high level of organisational learning. The current level of competencies and the importance of digital competencies for the job revealed a heterogeneous distribution, with only a small yet significant connection to organisational learning. The importance of competencies for digital tasks acts as an antecedent for the current level of and willingness to develop or enhance digital competencies. In other words, the importance of digital competencies serves as a starting point for the shift, affecting the level and willingness of employees as a necessary condition for a high level of organisational learning (Dul, 2016).

This result aligns with the work of Argyris and Schön. They point out that organisational learning is most effective when double-loop learning takes place, challenging the underlying assumptions with internal commitment to the change (Learn, 1977).

Regarding whether the current level of digital competencies is sufficient, and how their absence might lead to failures in daily routines, there is little need for a fundamental change. Therefore, they are necessary conditions for high levels of organisational learning. Employees` willingness to increase their digital competencies significantly impacts organisational learning. Hansen and Nørup (2017) highlight in their research that IT implementations cause high investments but often fail. They argue that close support, involving employees and persuading them to adopt new technology, enhances perceived performance (Hansen and Nørup, 2017).

The results of this study show that simply implementing new technology is not sufficient; there is a need for employees to be willing to develop or increase digital competencies as a necessary condition for successful organisational learning in the face of disruptive change. The results offer insights into the mechanism, of how and to what extent individual competencies and willingness to learn influence organisational learning capability in digitally transformed workplaces. As digital competencies become more important due to changes in work processes caused by new technologies, the greater the need for high-level organisational learning, where underlying shared assumptions about work need to be challenged (Learn, 1977).

This study indicates that employee involvement is essential as employees need to be willing to increase their level of digital competencies and invest in their own knowledge. Like Cook and Brown (1999) argue, it is not sufficient merely to possess knowledge; action must be taken with the willingness to improve. Takahashi (2017) highlighted in her research the relationship between the process of organisational learning and the development of competencies. Newly developed competencies are adapted over time and need to be renewed or leveraged. A change in resources leads to an organisational learning process (Takahashi, 2017). This is supported by empirical evidence, which shows that two of the investigated dimensions of digital competencies are recognised as necessary conditions for organisational learning. As Easterby-Smith, Crossan and Nicolini (2000) point out, there is a need for a closer focus on workplaces since new learning practices need to be established.

CONCLUSIONS

Digital transformation disrupts workplaces, changes individual tasks, or even creates entirely new professions. Employees need to build new, relevant competencies, and organisations must develop capabilities to be resilient and adapt to the change process. As organisational learning is highlighted in current research as a fundamental factor for performing in digital environments through knowledge and competence, the assumption is that digital competencies are impacting organisational learning as a prerequisite for adapting and performing in the transformed digital workplaces. The results of this study point out the importance of questioning basic assumptions and habits to adapt and reconfigure human resources for fundamental changes in digital transformation.

Theoretical Contributions

This study contributes to organisational learning theory by clarifying the role of digital competencies in the context of digital transformation. It extends prior work that has criticised organisational learning research for underdeveloped measures and fragmented frameworks (Easterby-Smith, Crossan and Nicolini, 2000; Dörner and Rundel, 2021) by offering operationalisations for three distinct dimensions of digital competencies and linking them to organisational learning outcomes. The findings suggest that the level and perceived importance of digital competencies represent necessary but not sufficient conditions: they must reach a certain threshold to avoid becoming bottlenecks in organisational learning. Although several of the hypothesised direct effects on organisational learning were not statistically significant, the

overall pattern of results reveals underlying mechanisms indicating that employees' willingness to learn plays a key role in fostering organisational adaptation and resilience (Do *et al.*, 2022). In this way, the study provides empirical evidence that digital competencies are a prerequisite for double-loop learning and organisational renewal in digitally transformed workplaces.

Practical Implications

For practitioners, the results underline the urgency of investing in digital competencies development as the foundation of organisational learning strategies. Managers should foster environments that not only enhance individual skill levels but also strengthen collective learning processes across teams and organisational structures. This implies creating opportunities for participation in communities of practice, aligning learning initiatives with strategic objectives, and embedding reflection to challenge basic assumptions and habits (Argyris and Schön, 1996). Organisations should prioritise targeted training, supportive leadership, and structural enablers to transform individual willingness into sustainable learning outcomes. By doing so, firms can reconfigure human resources and remain resilient in the face of disruptive change.

LIMITATIONS AND FURTHER RESEARCH

This study has several limitations, most notably the relatively small sample size, which restricts the generalisability of the findings. Furthermore, the structural model investigated only direct paths between the constructs of digital competencies and organisational learning. While this approach allowed for a clear assessment of the main effects, it may have overlooked potential indirect or mediating mechanisms that are theoretically implied in organisational learning processes.

Future research should purposefully examine mediated relationships, for example, whether the perceived importance of digital competencies influences organisational learning indirectly through the level of competencies or the willingness to increase them. Since the present study is cross-sectional, a longitudinal research design would be better to capture such mediation effects over time.

Given the multidimensionality and complexity of organisational learning, future studies should employ larger and more stratified samples, ideally within longitudinal designs, to strengthen statistical power and generalisability.

Using multi-source and performance-based measures of digital competencies, while also accounting for contextual factors such as leadership support and organisational culture, could increase the explanatory power. Complementary methodological approaches, such as fsQCA, would further support the identification of sufficient conditions and the establishment of causal inferences.

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