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Measuring digital literacy of company employees: towards an assessment framework

Karel Maršálek, Martin Potančok and Ota Novotný
Department of Information Technology,
Prague University of Economics and Business, Prague, Czechia

Abstract

Purpose – This paper addresses the lack of systematic approaches for assessing employees' digital literacy in a company context, reflecting a gap between conceptual frameworks and their practical application. Existing frameworks often remain insufficiently aligned with workplace requirements. The paper proposes an assessment framework and a complementary questionnaire designed to evaluate digital literacy within a company context.

Design/methodology/approach – Following the Design Science Research Methodology, the research builds upon the DigComp 2.2 framework and introduces an additional hierarchical dimension – competence elements – to provide a more granular representation of digital competences. Each element was scored according to its relevance to the companies' needs. A prototype questionnaire based on these elements was qualitatively validated through an expert panel in accordance with the 7S CARS-SID methodology.

Findings – The framework extends DigComp 2.2 with competence elements that better reflect workplace requirements. The 40-question prototype was positively evaluated by experts for its relevance and coverage, though recommendations were made to strengthen AI and security topics and include task-based testing for practical skills.

Practical implications – The framework provides companies with a practical tool to assess digital literacy, identify competence gaps, and guide targeted educational activities, ultimately supporting digital transformation efforts.

Originality/value – By extending DigComp 2.2 and aligning it with organizational needs, this study introduces a novel, company-focused approach to measuring digital literacy that enhances both theoretical understanding and managerial practice.

Keywords Digital literacy, Digital competence, DigComp, Assessment, Digital transformation

Paper type Research article

1. Introduction

Digital transformation has become an indispensable requirement for numerous companies in order to stay competitive in the current digital age (Khoshroo and Talari, 2025; Winarsih *et al.*, 2021; Zhang *et al.*, 2022). It has brought many new opportunities and challenges to companies and other organizations (Akter *et al.*, 2024; Al-Okaily, 2025; Gong and Ribiere, 2021; Ratna *et al.*, 2023; Vial, 2019). The effectiveness and overall outcome of such transformation processes heavily depend on various key factors, with the digital literacy of employees being a crucial one (Chaudhuri *et al.*, 2022; Farmakis *et al.*, 2025; Obermayer *et al.*, 2022).

Many authors have already discussed the skills required for the use of digital technologies. The skills and knowledge that were essential for the workforce in previous decades are becoming less relevant, as entirely new requirements are being posed on employees in companies in the current digital age (Cetindamar Kozanoglu and Abedin, 2020; Chatterjee *et al.*, 2023; Civelek *et al.*, 2023; Kane, 2019; Rocha *et al.*, 2023). Various overarching terms, such as digital literacy, digital skills, and digital competences, have been introduced over the

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years. While the consensus on their interchangeability is not definite (Blanka *et al.*, 2022), we regard digital skills and digital competences as equal, interchangeable terms (Bejaković and Mrnjavac, 2020; Jin *et al.*, 2020a; Obermayer *et al.*, 2022). Digital literacy is then approached as an umbrella term encompassing skills or competences that are connected to the use of digital technologies (Briggs and Makice, 2012; Ilomäki *et al.*, 2011; Ng, 2012; Yildiz, 2020).

It can be stated that digital literacy is one of the essential enablers of digital transformation processes (Gerli *et al.*, 2022; Neumeyer *et al.*, 2021). Despite that, digital literacy – in a company context – has received only minor attention among both academic and business-oriented publications (Meske and Junglas, 2021; Silva *et al.*, 2022), and it has often been regarded as an obvious and easily fulfillable prerequisite of digital transformation processes. However, this is a false assumption that can significantly diminish the potential positive effects of digital transformation. It is vital to raise awareness about the importance of digital literacy and ensure that employees possess the skills and knowledge necessary to use digital technologies in their work to their full potential, or at least to a satisfactory level.

There is currently a significant knowledge gap regarding the concept of digital literacy in a company environment, especially in terms of methods to measure the level of digital literacy among people in companies and how different levels of digital literacy affect digital transformation processes.

Several frameworks and tools aimed at measuring the level of digital literacy have already been introduced. Nevertheless, these typically involve trade-offs in terms of their comprehensiveness and practical applicability in a company setting. Rather than claiming the complete absence of relevant instruments, this paper addresses the limited availability of assessment instruments that would provide the company management with a complete view of how their employees in a specific department or across the entire company perform in terms of digital literacy. To illustrate the lack of an efficient means for measuring digital literacy, we provide a critical review of existing frameworks and tools, summarizing the common limitations of these instruments: the self-perception approach, outdatedness, inadequate scope, narrow target group, and inadequate extent.

Guided by the identified research gap, the paper addresses the following research questions:

RQ1. Which digital skills and knowledge are relevant for assessing employees' digital literacy in a company context, with respect to workplace requirements?

RQ2. How can an established digital literacy reference framework be adapted to enable efficient and comprehensive assessment of employees' digital literacy in companies?

Based on these questions, the main objective of this research is to design an assessment framework for measuring the level of digital literacy of employees in a company context. The framework will be supplemented by a tool that will be used for testing individual employees. This tool will have the form of a questionnaire containing questions focused on various company-relevant skills and knowledge that involve the use of digital technologies. The research as a whole is conducted in alignment with the Design Science Research Methodology (DSRM; Peffers *et al.*, 2007). DSRM as a core methodology was selected since it represents a standardized and well-structured methodology for applied research. It also stresses the importance of practical demonstration and evaluation, thus providing a solid basis for creating artifacts that have real-world applicability.

In this paper, we focus mainly on identifying the company-relevant skills and knowledge to be included in the assessment framework and, subsequently, on designing a prototype questionnaire. This corresponds to the first three phases of the DSRM process, specifically: Identify problem and motivate, Define objectives and solution, Design and development.

The assessment framework will provide an opportunity for companies to assess the level of their employees' digital literacy and determine whether this level is sufficient with regard to

the current needs of the company. The framework will allow for the assessment of the digital literacy of employees across various dimensions, e.g. in different positions or departments within the company or for the company as a whole. Based on the digital literacy measurement, the framework will also provide targeted suggestions for improving the level of specific skills among the employees.

The proposed framework is intended primarily for non-specialist and semi-specialist roles. It targets employees whose primary responsibility is not the development or administration of digital technologies, but who are nevertheless required to use digital tools, data, and platforms as an integral part of their work. Typical examples include knowledge workers, administrative staff, operational managers, and frontline employees interacting with digital technologies.

The primary contribution of this research is not the proposal of an entirely new conceptual model of digital literacy, but the design of a company-oriented assessment framework that operationalizes DigComp 2.2 for use in companies. The framework constitutes a design artefact that translates an established competence model into a structured assessment logic. A prototype questionnaire and complementary task-based assessment are then presented as one possible instantiation of this framework.

2. Review of existing assessment frameworks and tools

As digital literacy has been a widely discussed topic for the past few decades, a number of assessment frameworks and tools have already been introduced. However, these tend to suffer from several limitations.

A prevalent feature of the reviewed assessment frameworks and tools is that they are based on self-perception (Boot *et al.*, 2015; van Deursen *et al.*, 2016; Digiskills.cz, 2025; Garzon-Artacho *et al.*, 2021; van Laar *et al.*, 2018; Roque and Boot, 2018; Siiman *et al.*, 2016) or self-efficacy (Ulfert-Blank and Schmidt, 2022). While there is undisputable value in these kinds of assessments, and they can provide a solid picture of how digitally literate the respondents are, we argue that it is not the ideal form of assessment. Ultimately, such assessments test not how proficient the respondents are but how proficient the respondents believe they are.

Another issue concerns the dynamically evolving nature of digital technologies and skills. This fact, unfortunately, makes many of the reviewed assessments appear outdated in terms of their scope and the skills they focus on (Bartolomé *et al.*, 2018; Boot *et al.*, 2015). This is further amplified by the recent developments in artificial intelligence and cybersecurity. The rapid adoption of AI into organizational processes is reshaping the workplace, requiring employees to develop new AI-related capabilities (Adepoju and Adepoju, 2025). In parallel, digital security skills are becoming increasingly crucial, as organizations face increasingly sophisticated, AI-enabled cyber threats (Graham, 2025).

The inadequate scope for the purposes of digital literacy is often caused by the author's intention. Many of the reviewed assessments focus only on specific subcomponents (specific sets of skills, e.g. media skills, Internet skills, mobile skills, computer skills) of digital literacy, which unfortunately makes their scope too narrow for the purposes of measuring digital literacy as a whole (Bartolomé and Garaizar, 2022; van Deursen *et al.*, 2016; Dornaleteche-Ruiz *et al.*, 2015; Northstar, 2024; Roque and Boot, 2018).

Another dimension of narrowing the assessment's scope relates to the target group of people for whom the assessment is intended. In this regard, the assessments often focus on the digital literacy of the elderly (Boot *et al.*, 2015), students – either in primary or secondary education (Jin *et al.*, 2020b; Pongrac *et al.*, 2025; Siiman *et al.*, 2016), or teachers (Garzon-Artacho *et al.*, 2021). A large number of other assessments tailored to these groups, especially students and teachers, were screened but not included in this paper. The few assessments mentioned in this paper were included mainly to demonstrate that assessments focusing on other target groups also exist and are definitely significant for other fields.

Lastly, a very tricky aspect of any assessment is its extensiveness, i.e. how thoroughly the participants are tested. This can range from a brief and/or superficial assessment that provides

an initial screening of the participant's knowledge and skills but does not go enough into depth – such is the case of the Digital skills self-assessment tool (European Union, 2022), which is a tool directly recommended in DigComp 2.2.

On the opposite side of the spectrum are comprehensive certifications, with the International Certification for Digital Literacy (formerly known as the European Computer Driving Licence) being the most notable one. ICDL Certification is a widely recognized certification program for the assessment of an individual's proficiency in computer skills (ICDL, 2024). ICDL workforce modules cover a significant portion of digital literacy's scope, mainly the computer, information, data, communication, collaboration, and safety skills (ICDL, 2024). However, ICDL's scope is much wider since they do not solely focus on the workforce but also provide certifications aimed at students and digital citizenship.

While there is an undisputable need for such comprehensive certifications, their extensiveness is also a disadvantage in certain scenarios. The whole process of completing all workforce-relevant modules and certification paths included in ICDL is very time-consuming and does not provide a single complete picture of an individual's digital literacy level. Instead, it aims to split digital literacy into very granular components and test each of these components separately.

The certification nature of ICDL also leads towards a rather individualistic approach in terms of the employees' completion rate of the ICDL modules. We argue that the value of such certifications is mainly rooted in proving an individual's level of capabilities rather than assessing these capabilities across a whole company or department. While knowing that a few individual employees have completed a few specific (not even necessarily all) ICDL certifications is beneficial, it does not provide the company management with a complete picture of the actual digital literacy level in their department or company.

To summarize, this critical evaluation of existing assessment instruments highlights the recurring limitations: self-perception approach, outdatedness, inadequate scope, narrow target group, and inadequate extent. This is not to question the relevance and usefulness of these instruments for specific cases, but to highlight the gap in terms of comprehensive and efficient means to assess digital literacy in companies.

3. Methodology

The review highlighted the limited applicability of existing frameworks and tools for assessment purposes in company settings. In response, the following methodological approach focuses on extending DigComp 2.2 to a company-oriented operationalization of digital literacy.

3.1 Specifying competences into competence elements

A crucial step in designing an assessment framework was to select an appropriate digital literacy reference framework. These reference frameworks are essential in guiding the development and assessment of digital literacy, mainly by establishing an agreed terminology, identifying skills that are required in the current digital world, providing a basis for designing educational curricula, and sometimes also offering criteria for assessing digital literacy.

The choice ultimately came down to the latest version of The Digital Competence Framework for Citizens, abbreviated DigComp 2.2 (Vuorikari *et al.*, 2022), which serves as a common reference framework for digital competences in Europe and has already been used by a large number of authors and organizations as a basis for creating frameworks, assessments, or constructs for measuring digital literacy. In order to be aligned with the selected reference framework, this paper takes over the definition of digital competence definition provided by DigComp and uses it to define the scope of digital literacy.

DigComp 2.2 is composed of five dimensions. In DigComp's terminology, dimensions serve to organize all the elements of the framework and define how the elements relate to each other. The five dimensions are (Vuorikari *et al.*, 2022):

(1) Dimension 1: Competence areas

(2) Dimension 2: Competences

(3) Dimension 3: Levels of proficiency

(4) Dimension 4: Examples of the knowledge, skills and attitudes

(5) Dimension 5: Use cases

While the structure DigComp's of competence areas and competences provides a solid picture of what aspects contribute to the overall digital literacy of an individual, the scope of each competence is still too broad to serve as a basis for an assessment. A more granular view of the competences is available when we combine the competences (dimension 2) with levels of proficiency and examples (dimensions 3 and 4).

When we focus only on competence areas and competences (dimensions 1 and 2), there is an apparent hierarchical structure, which is based on the relation between these two dimensions – with the competence area being the parent item and each competence belonging to precisely one of the superior competence areas. However, when discussing the relation between dimensions 2–4, there is no clear hierarchical structure that can be derived from a combined view of these three dimensions.

To address this limitation, we decided to extend the DigComp 2.2 framework by expanding the hierarchical structure of competence areas and competences (dimensions 1 and 2) with a third – more granular – level of this hierarchy. This third hierarchy level is a result of systematically combining the information from levels of proficiency and examples (dimensions 3 and 4), which are available for each individual competence. Toimply that this third level offers a more granular view than the competences, we introduced the term "competence element" to describe each member of this level (see Figure 1).

Competence elements are defined as atomic units that operationalize DigComp competences for assessment in a company context. Each competence element is derived from exactly one DigComp competence, describes assessable behavior relevant to digital technologies, and avoids redundancy with other elements within the same competence. The aim of this extension of the DigComp 2.2 framework was not to introduce any disparate way of

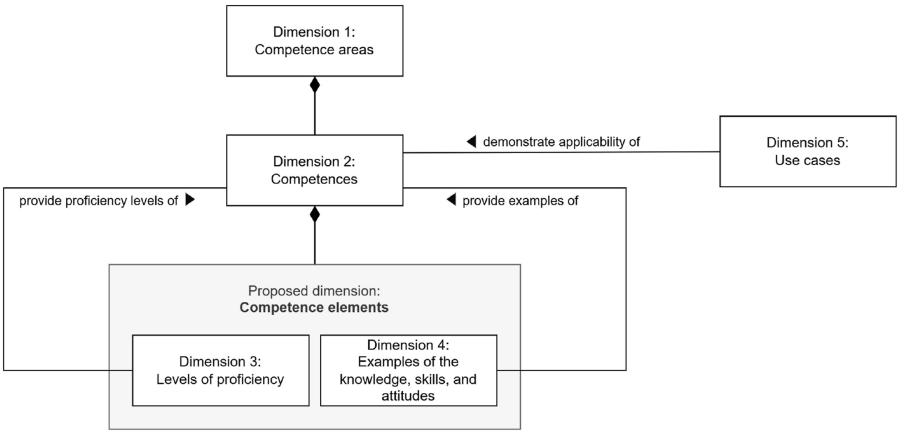

Figure 1. Expanded hierarchical structure of DigComp 2.2 dimensions. **Source:** Authors' own work

approaching the digital competences but to provide a comprehensive granular view of the competences while fully aligning with the information already available in DigComp.

3.2 Identifying company-relevant competences and competence elements

Already the DigComp definition of digital competence implies that the framework itself is not only aimed at using digital technologies in a company context ("at work") but also for "learning and participation in society". Therefore, for the purposes of constructing an assessment framework for measuring digital literacy in a company context, it was first necessary to identify which of the DigComp competences are genuinely relevant to companies (and to what extent).

Having previously split the DigComp competences into more granular competence elements allowed us to be more precise with this process. Each competence element was assigned a score on a scale from 1 to 10 based on its relevance in a company context, with 10 standing for the most relevant. As the questionnaire for measuring digital literacy is not aimed at specialists and very advanced users of digital technologies, several competence elements were excluded before the score assignment began.

The relevance scoring of competence elements was conducted by the authors of the paper, drawing on their combined academic and professional experience in digital transformation and information systems. Prior to scoring, a shared set of evaluation criteria was defined, which included the frequency of use in typical work tasks, relevance across multiple industries, impact on effective use of digital technologies, and relevance for company's digital transformation. Each competence element was initially scored independently by the authors. In cases where substantial discrepancies occurred, the scores were iteratively discussed until consensus was reached, essentially following a simplified Delphi-style process.

After assigning each competence element (except for the excluded ones) with a relevance score, we used these scores to calculate average scores on the level of competences. Afterward, the average scores on the competence level were used to calculate average scores on the competence area level. We decided to use this cascading calculation of averages for the competence area level. Using the cascading calculation of averages ensures that all competences have the same base importance when aggregating to the higher level of competence areas.

Each competence needed to reach an average score of at least 6 in order to be considered sufficiently relevant to companies. Competences that did not meet the threshold were therefore filtered out. This threshold was selected as a pragmatic compromise between inclusiveness and practical feasibility. The threshold was later confirmed during expert panel validation, as higher thresholds would have led to the exclusion of competences considered important by parts of the expert panel, whereas lower thresholds would have resulted in an overly extensive assessment instrument.

The proposed balance in terms of the relevance of competences and competence elements is intended to be universally applicable to companies of various sizes and industries. Nevertheless, contextual adaptation of the framework is supported through adjustable emphasis at the level of competence elements. Companies may increase or decrease the weight of selected competence elements to reflect industry-specific requirements or balance between knowledge work and frontline operations while preserving the framework's core structure.

3.3 Validation of prototype questionnaire

After introducing the dimension of competence elements, identifying company-relevant competences and competence elements, and subsequently designing a prototype questionnaire, it was necessary to conduct a qualitative validation to assess whether the questionnaire could be used to efficiently measure employees' digital literacy.

The qualitative validation was conducted in the form of an expert panel, consisting of 11 professionals from both academic and business spheres. The academic side of the panel

($N = 3$) consisted of researchers with a long-standing focus on digital transformation and its success factors, information systems, and the education of digital skills. The business experts were represented by HR managers responsible for talent acquisition and employee development ($N = 2$), then a delivery director ($N = 1$), and senior consultants ($N = 5$) who focus on delivering digital transformation projects in various industries – mostly in manufacturing, banking, insurance, retail, and pharmaceutical.

All participants were first asked to complete the prototype questionnaire and then participated in a semi-structured interview, which followed the 7S CARS-SID (*Seven Steps to Conducting, Analyzing, and Reporting Semi-Structured Interview Data*) methodology (Adeoye-Olatunde and Olenik, 2021). The interviews focused on several pre-selected themes, which reflected key attributes of the questionnaire's quality: content and coverage, scope, complexity, types of questions, and overall form.

4. Results

4.1 Introduction of competence elements

The hierarchical structure of competence areas and competences (dimensions 1 and 2) of the DigComp 2.2 framework was extended with a third level – competence elements. This level was derived from the existing levels of proficiency and examples (dimensions 3 and 4) defined for each competence. This extension aims to offer a more granular view of competences while remaining fully consistent with the original DigComp structure.

The introduction of competence elements enabled a more precise operationalization of digital competences for assessment purposes. By decomposing competences into smaller units, it became possible to differentiate between different aspects of a competence with varying relevance.

Several competence elements were then excluded due to being aimed only at specialists or very advanced users, who are not the target group for the proposed assessment. Another exclusion was aimed at competence elements related to the *3.4 Programming* competence. This is because programming is, in a company context, still a very specialized area to which the company usually dedicates specific employees whose main area of expertise is programming.

4.2 Creation of prototype questionnaire

The first version (prototype) of the questionnaire for measuring the level of employees' digital literacy was designed based on the previous identification of the competences relevant to the company context. The calculated average relevance scores signify the degree to which the particular competence or competence area is relevant to companies. With this assumption, these average scores were used to estimate the proportion of questions that should be dedicated to each competence or competence area in the resulting questionnaire.

A key design consideration was balancing comprehensiveness and completion time. The questionnaire was designed to provide sufficient coverage of digital literacy while remaining not overly time-consuming to prevent respondent's fatigue and ensure a sufficiently high completion rate (Sharma, 2022). The target completion time was set to 30 min, which is considered to be the upper limit for such questionnaires (Revilla and Höhne, 2020; Sharma, 2022), resulting in a total of 40 questions. The target completion time was later examined during the expert panel validation, during which it ranged between 27 and 39 min.

The 40 questions were then distributed across competence areas according to their average relevance scores. These allocations at the competence area level were then split proportionally between all pertinent competences based on each competence's relevance. The resulting counts of questions assigned to each competence were mostly decimal numbers. Since the actual count of questions has to be a whole number, these calculated counts were used as estimates, while the actual count was always set to a close proximity to the estimate.

Based on the minimum required average score being set to 6, several competences were further filtered out as being insufficiently relevant to companies, resulting in their question count being zero. The allocation of questions across competence areas and competences is directly derived from the relevance scoring and is presented in detail in Tables 1 and 2.

Content-wise, the questions were inspired primarily (80% of questions) by DigComp's examples and use cases (dimensions 4 and 5). These served as a basis for defining what the respondent should know or be able to perform for each competence. The scope of the remaining questions was inspired by other existing assessments, mainly the Digital skills self-assessment tool (European Union, 2022).

Once the scope for each individual question had been defined, we created, at least for the majority of the questions, four possible answers to choose from for each question, with some answers being purposefully incorrect. For the task of question preparation, we used the assistance of the AI tool ChatGPT, specifically with its GPT-4 engine (OpenAI, 2024), as such tools can greatly increase the efficiency and velocity of drafting processes in academic research (Lendvai, 2025). To ensure validity and avoid bias, AI-generated content was treated as a preliminary draft only. The generation process followed a predefined prompt structure built on recommendations for questionnaire generation (Indran *et al.*, 2024). The prompt operated with contextual information regarding the specific competence element, the expected difficulty level, examples of the particular proficiency level, and workplace context. The entire DigComp 2.2 framework was also included in the prompt context to ensure consistency of the generated questions with this reference framework. The generated wording of the questions, as well as the possible answers, were subsequently checked by the authors, inadequate questions were filtered out, and the remaining questions were accordingly revised, especially with regard to their factual accuracy, complexity, and balance of the possible answers.

The majority of the questions (60%) are multiple-choice single-answer questions, 35% are multiple-answer questions. For both of these types of questions, four possible answers are always available. The remaining questions are based on matching the corresponding terms with each other.

Overall, the results demonstrate that extending DigComp 2.2 through competence elements enables a company-oriented operationalization of digital literacy. The relevance-based selection of competences provides a basis for assessment, while the resulting 40-item questionnaire offers a balanced combination of comprehensiveness and practical applicability.

5. Discussion

5.1 Theoretical and methodological implications

With respect to the formulated research questions, this paper expands upon the DigComp 2.2 framework by introducing an additional dimension – competence elements – that offers a granular view of digital competences. Addressing the RQ1, these competence elements were

Table 1. Relevance scores and question counts by competence area

Competence area	Average relevance score	Question count estimate	Prototype question count
Information and data literacy	8.94	9.94	10
Communication and collaboration	6.64	7.38	7
Digital content creation	6.25	6.94	7
Safety	6.67	7.41	8
Problem solving	7.50	8.33	8
Total		40	40

Source(s): Authors' own work

Table 2. Relevance scores and question counts by competence

Competence	Average relevance score	Question count estimate	Prototype question count
1.1 Browsing, searching and filtering data, information and digital content	9.33	3.46	4
1.2 Evaluating data, information and digital content	8.50	3.15	3
1.3 Managing data, information and digital content	9.00	3.33	3
2.1 Interacting through digital technologies	10.00	2.21	2
2.2 Sharing through digital technologies	7.33	1.62	1
2.3 Engaging citizenship through digital technologies	2.00	0.00	0
2.4 Collaborating through digital technologies	8.00	1.77	2
2.5 Netiquette	8.00	1.77	2
2.6 Managing digital identity	4.50	0.00	0
3.1 Developing digital content	10.00	2.78	3
3.2 Integrating and re-elaborating digital content	8.00	2.22	2
3.3 Copyright and licenses	7.00	1.94	2
3.4 Programming	0.00	0.00	0
4.1 Protecting devices	10.00	3.90	4
4.2 Protecting personal data and privacy	9.00	3.51	4
4.3 Protecting health and well-being	3.67	0.00	0
4.4 Protecting the environment	4.00	0.00	0
5.1 Solving technical problems	8.00	2.22	2
5.2 Identifying needs and technological responses	7.00	1.94	2
5.3 Creatively using digital technology	7.50	2.08	2
5.4 Identifying digital competence gaps	7.50	2.08	2
Total		40	40

Source(s): Authors' own work

evaluated and scored based on their relevance to companies. RQ2 was addressed by adapting DigComp 2.2 into a company-oriented assessment framework and operationalizing it into a prototype questionnaire, whose structure and content were validated by experts.

From a theoretical perspective, the introduction of competence elements does not create a new conceptual model of digital competence, but rather an operational refinement of an established reference framework. By decomposing broad DigComp 2.2 competences into smaller units, the paper contributes to bridging the gap between high-level competence definitions and their practical assessment in companies.

From a methodological standpoint, the evaluated structure of competence elements enabled the design of a prototype questionnaire aligned with DigComp 2.2 and reflecting company-relevant priorities. The questionnaire consists of 40 questions proportionally distributed across digital competences based on their assessed relevance to companies.

The expert panel validation indicated a generally positive response to the prototype questionnaire. Recurring were confirmatory statements regarding the extent and complexity of the assessment, as the experts considered the balance between comprehensiveness and the time required for completion appropriate. Due to the breadth of digital literacy, they did not believe any significant shortening of the assessment is feasible, as it would reduce the comprehensiveness of the assessment to a degree where it would no longer reliably assess the respondent's digital literacy level.

Participants agreed that the competences included were relevant and sufficiently covered, although several noted the need for stronger emphasis on AI and security topics. Importantly, experts highlighted the need to complement the questionnaire with a task-based test to better assess practical skills, and they highlighted the importance of a careful selection of digital tools to ensure accessibility and relevance. The experts also frequently highlighted the importance

of providing the company management with suggestions on concrete action steps, i.e. what specific actions the company or department should take based on the assessment's results.

In this sense, the expert validation functioned not only as an evaluative step but also as a formative input for the redesign of the assessment framework.

5.2 Practical implications

When compared to existing digital literacy frameworks, the proposed assessment framework provides an additional level of granularity for structuring digital competences. At the same time, this additional level – represented by competence elements – fully aligns with the DigComp 2.2 framework and further extends the DigComp's practical applicability.

The assessment framework and questionnaire are proposed to tackle the limitations of the existing frameworks and tools, such as self-perception approach, outdatedness, inadequate scope, narrow target group, and inadequate extent.

From a practical perspective, the framework and questionnaire are designed to be universally applicable to companies of various sizes (from SMEs to large companies) and various industries. While the core structure remains stable, the framework allows for contextual adaptation, e.g. by adjusting the emphasis placed on specific competence elements. In this way, the proposed framework can support companies in systematically assessing employees' digital literacy and identifying gaps at individual or aggregated levels. From educational and training perspectives, the framework can subsequently be used to map educational initiatives to specific competence gaps, thereby informing targeted initiatives that support digital transformation efforts. For example, a company in the financial sector may use the framework to identify gaps in data handling and cybersecurity competences among frontline employees and, subsequently, assign targeted training activities where necessary.

An important practical consideration is that employees cannot be treated as a homogeneous group when assessing digital literacy. In particular, Generation Z is often characterized by high proficiency in digital technologies and strong familiarity with digital environments (Sarıkaya, 2025). This cohort generally demonstrates higher levels of competence in areas such as protecting devices, managing digital identity, and information literacy (Pongrac *et al.*, 2025).

However, this technological familiarity does not necessarily translate to universally strong competences across all domains, as digital natives may still exhibit gaps in certain areas. Therefore, assessment results need to be interpreted with respect to specific workforce segments, and subsequent educational and training activities should be tailored accordingly.

5.3 Limitations and future research

While this paper offers valuable insights into the assessment of employees' digital literacy, there are still several remaining steps on the road toward a complete, comprehensive, and, most importantly, practical digital literacy assessment framework.

Based on the conducted validation of the prototype questionnaire, it is apparent that the questionnaire/test will undergo several changes in the near future. Nevertheless, these changes will probably not have to be extensive, as the core aspects of the questionnaire seem to be on point. To reach final conclusions on the practicality of this digital literacy assessment, however, further empirical validation in real company settings will need to be performed. This will help improve the applicability of the framework across different company contexts. Future research may also incorporate focus groups to further explore respondent perspectives and refine the assessment framework.

Another aspect of the research, which could be perceived both as an obvious feature and a limitation, is the challenge of maintaining the assessment framework's scope and questions included in the questionnaire up to date. As the world of digital technologies continues to evolve rapidly, there is a need to continuously review and update the content of the proposed framework and questionnaire. This need can already be demonstrated in the example of AI-related topics, which, during the completion of DigComp 2.2 in 2022, were still quite distant to

regular employees in companies, even though they have been heavily discussed in the academic spheres a long time before that. Now, just a couple of years later, the unprecedented growth of large language models (LLMs) and generative AI – represented by ChatGPT, Copilot, Gemini, DALL-E, and many others – has already caused another significant shift in the digital competences and tools employees require for their work. The increased emphasis on AI- and security-related competence elements is apparent in the expert validation results and reflects the currently emerging workplace requirements.

Apart from defining the scope of digital competences necessary for employees and providing a practical tool to test these competences, there is the apparent need to provide actionable feedback and recommendations to both the respondents and the company about the assessment. As part of future research, the assessment framework will be extended by a mechanism and tool for providing detailed and structured feedback to individual respondents reflecting their level of digital literacy, as well as recommendations on how to improve in specific areas in which they may currently be lacking. Moreover, the assessment results will also be available to the company management in an aggregated manner, which will provide the company with crucial insights into the digital literacy level of their employees and help identify the areas in which they need to improve.

6. Conclusion

This paper presents the first steps in creating a framework for the assessment of digital literacy in a company context, addressing a significant gap in the current research. By expanding the DigComp 2.2 framework with the dimension of competence elements and assigning scores to these elements based on their relevance to the needs of companies, this paper introduces a more detailed and company-specific view of digital literacy.

Ultimately, the proposed assessment framework and questionnaire are designed to help companies assess the digital literacy level of their employees and identify any gaps that could hinder or completely block their digital transformation efforts. By providing companies with the means to measure and improve digital literacy, this research makes an important contribution to supporting organizations in navigating the challenges of the current digital age. As digital literacy continues to be a key success factor in digital transformation, the framework and associated tools will offer valuable insights for individual employees and company management, facilitating the development of a more digitally competent workforce.

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Corresponding author
Karel Maršálek can be contacted at: karel.marsalek@vse.cz