RAISING THE READINESS FOR USING DIGITAL TECHNOLOGIES IN TEACHING PROCESSES

S. Križanić, L. Hrustek, K. Tomićić-Pupek

University of Zagreb, Faculty of Organization and Informatics (CROATIA)

Abstract

Technologies related to Digital Transformation or technologies of Industry 4.0 are shaping the development of a modern society. Mobile and cloud technologies, social media and platforms, big data and data analytics, artificial intelligence, virtual and augmented reality, autonomous systems and robotics are some of them. Their role in the teaching processes is twofold: they can be the subject of research or means of learning and teaching. Relevance of digital skills and competences increases in every workplace at the labor market; therefore, universities have to include digital technologies into the curricula and operationalize their application in agendas for future professionals. In order to prepare students for resolving complex domain problems by using their digital skills, teachers apply different approaches and initiatives for digital transformation of teaching processes. In case of treating digital technologies as a means of learning and teaching, the usage level of these technologies depends on the teacher's competences and their readiness to apply technology in the teaching process. Therefore, it is important to understand which elements can affect the readiness of teachers to use technology in performing teaching processes.

In that context, we analyse the application of digital technologies in teaching based on academic publications since the time of intense development of digital technologies. Then we explore which organizational and individual factors can affect the teacher's readiness to use digital technologies in order to identify their impact. Based on this impact factors, we propose a model for developing strategies for raising the readiness for using digital technologies in teaching processes.

Keywords: readiness, digital technologies, teaching process.

1 INTRODUCTION

The evolution of technologies related to Industry 4.0. impacts the development of modern societies by redesigning operational models of collaboration and communication. New workplaces, skills, services and interaction channels set new demands on actors involved in producing new values – this means that the academia, whose contributive role is to educate, must transform itself and the way of educating while meeting the standards of the 21st century higher education innovation [1].

The emphasis of transformed academic enterprise architecture is on collaboration and raising quality of academic work [2]. Besides methodological and didactic competences, covering “clarity, quality and interesting presentations, adaptability to the situation in classroom, innovation in teaching” [3] being significantly important in case of evaluation of teachers, possibilities of where technologies can enable teachers to go, will in future shape research in this field [4].

Digital transformation of strategic and operational process models also emphasizes the importance of customer experience, whereby students represent actively involved process actors and teachers become guides in their learning experience [5]. Digital transformation in educational institutions cannot suddenly appear, it needs to evolve and achieve an appropriate digital maturity level that is set in their institutional environment. Frameworks for assessing digital maturity help analysing progress in integration and in the efficient use of contemporary technologies. They also allow to identify potentials of improvement [6] whereby following elements influence either institutional or personal maturity: digital skills, digital devices (gadgets), digital content, digital trends, digital culture [7]. Effective design, development and implementation of ubiquitous learning environments [8] are setting teachers in front of new challenges in form of keeping up with new demands in the learning industry, and in need to raise their own readiness for using digital technologies in teaching processes to achieve personal digital maturity.
2 METHODOLOGY

In order to gain insights into relevant research on this topic, we examined published journal articles and conference papers listed in two online scientific citation indexing services: Web of Science (WoS) and Scopus. Our search in WoS and Scopus was based on following keywords: “digital transformation AND teaching AND higher education AND technology” in the time span from 2014 till 20th March 2019. The search resulted with 43 items in WoS and 34 in Scopus. Basic analysis showed that some results were found matching in both research platforms resulting thereby with a total of 64 papers. A qualitative content analysis of collected scientific articles and papers was performed and a concept-based literature systemization has been applied. Based on abstract analysis of gathered literature, we formed a preliminary list of concepts, which seem to impact the readiness of teachers to use technology in performing teaching processes:

- Skills/competencies: besides domain specific, methodological, pedagogical and professional knowledge, skills and competencies related to digital literacy;
- Motivation and innovation: this concept encompass intrinsic, organizational, student-initiated motivation and innovation elements, and we focused on searching for publications reporting about them;
- Content and course subject (course topics) are elements which are oriented on exploring if course subject of teaching plays a significant role in evaluating the suitability for educational process digitalization and if course subject impacts the fitness for implementing digital innovation;
- Resource management explaining or characterising personal or organizational commitment to going digital, especially in form of organising educational events for the use of digital technologies, dedicating time and space for preparation, insuring needed equipment for creating, storing and sharing digital contents, implementing personal time management for online activities and similar initiatives;
- Infrastructural elements which can be ensured personally by the educator, at the organizational or institutional level, or by other collaborating institutions like professional (domain-related) associations or communities.

Based on the results of systemized impact factors among these five concepts, we formed a model for developing strategies for raising the readiness for using digital technologies in teaching processes.

3 RESULTS

Following our methodology, we explored organizational and individual factors which can affect the teacher’s readiness to use digital technologies in order to identify their impact and form a model for developing strategies for raising the readiness for using digital technologies in teaching processes.

3.1 Concept-based impact systemization

After conducting our qualitative and quantitative analysis, overall 28 papers contained valuable input. Results of our Concept-based impact systemization are shown in Table 1, which consists of two columns representing concepts of impact and findings from the literature analysis.

<table>
<thead>
<tr>
<th>Concept of impact</th>
<th>Findings and source</th>
</tr>
</thead>
<tbody>
<tr>
<td>C1: Skills/competencies</td>
<td>Digital competences like technical, social and informational competencies, from the teacher and student perspective [9]; Information seeking behaviour of students, usage of online legal databases [10]; Usage of advanced teaching methods like transmedia storytelling [11]; Social networks and online videos as a paradigmatic change in teacher training [12]; Introduction of multimedia and multimedia technologies in educational programs in journalism [13]; Blended learning combining digital technologies and face-to-face education [14];</td>
</tr>
</tbody>
</table>
Looking more in detail the elements within the concept-based impact systemization, infrastructure arises as a most addressed issue, since most findings are reported about the infrastructural elements. Infrastructure is an organizational factor, which can be dealt with on the institutional level and therefore teachers have only a limited influence on the dynamics and extent of purchasing digital technologies. Remaining four concepts can be managed at the organizational level, but are also affected by individual effort or contribution of teachers. For this reason, we will consider infrastructure as a prerequisite for raising teacher’s readiness to use digital technologies in educational processes. Remaining four concepts and their elements form the determinants for our strategy development model.

### 3.2 Model for developing strategies for raising digital readiness

In previous section, we have set infrastructure as an organizational prerequisite for raising teachers’ readiness for using digital technologies in teaching processes. Remaining organizational and individual factors are used to form our model for developing strategies for raising the teachers’ digital readiness. The model is shown in Table 2, and it is described afterwards.
Table 2: Model for developing strategies for raising the readiness for using digital technologies in teaching processes

<table>
<thead>
<tr>
<th>Concept C1: Do I have appropriate skills/competencies?</th>
<th>Combination of concepts C_i and C_j</th>
</tr>
</thead>
<tbody>
<tr>
<td>+ + + -</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concept C2: Do I have enough motivation and am I willing to innovate?</th>
<th>Combination of concepts C_i and C_j</th>
</tr>
</thead>
<tbody>
<tr>
<td>- + + + -</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concept C3: Do content and subject fit the digital improvement potential?</th>
<th>Combination of concepts C_i and C_j</th>
</tr>
</thead>
<tbody>
<tr>
<td>- - + + + -</td>
<td>-</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Concept C4: What is the level of resource management in my environment?</th>
<th>Combination of concepts C_i and C_j</th>
</tr>
</thead>
<tbody>
<tr>
<td>- - - + + +</td>
<td>-</td>
</tr>
</tbody>
</table>

The model shown in Table 2 is designed according to the structure of the basic concepts C1 to C4 and the sequence of steps that follow.

1. It is first necessary to evaluate the satisfaction of each influence factor within each concept. For this purpose, a set of factors in Table 1 may be used or may be supplemented, if necessary, by specific institutional or individual factors. The evaluation has a binary rating:
   - positive (if most factors are considered satisfactory)
   - negative (if most factors are considered unsatisfactory)
   
5604
This is shown in the upper part of the table with the "+" and "-" tags.

2 In the next step, we select pairs of concepts with 1 positive and 1 negative mark, considering that we observe 4 concepts, 4 * 3 and 12 combinations are possible. For example, the evaluation can reveal that digital skills and competences at a satisfactory level ("+"), but that there is not a satisfactory level of resource management ("-").

3 Each pair of combinations can have one or more proposed strategies, and one strategy can be achieved in a different range of different paired combinations. The proposed set of pairs of evaluated concepts and achievable strategies that can be implemented, are given in the middle of the table, with the "x" marking designating the relationship between the concept-pairs and the strategy. Depending on the position of the "x", strategies available for each pair combination can be read. For the earlier given example, possible strategies are given in Table 3, as a clipping from Table 2.

<table>
<thead>
<tr>
<th>C1: Do I have appropriate skills/competencies?</th>
<th>+</th>
</tr>
</thead>
<tbody>
<tr>
<td>C4: What is the level of resource management in my environment?</td>
<td>-</td>
</tr>
<tr>
<td>Develop a feasible plan and effectively manage the change of curricula</td>
<td>x</td>
</tr>
<tr>
<td>Develop policy guidelines for acceptance of devices in teaching processes</td>
<td>x</td>
</tr>
<tr>
<td>Assure content management systems for effective sharing and exchange of e-contents</td>
<td>x</td>
</tr>
<tr>
<td>Create a strong and supportive infrastructure</td>
<td>x</td>
</tr>
<tr>
<td>Stay focused on change by encourage strategic planning of digital technologies inclusion</td>
<td>x</td>
</tr>
</tbody>
</table>

The list of proposed strategies in our model comes from the set of factors found in literature analysis and can also be supplemented or adapted to a specific institutional or individual environment. The goal of this model is not to unify the way of raising digital readiness but to offer the principle of reflection on the realization of the set goals. Also, in order to keep the focus on change, we suggest that out of all listed possible strategies, only 3-5 should be chosen which promise a shift in achieving increased readiness and which have available resources for implementation.

The model for developing strategies can be read in reverse, meaning that it is possible to select 3-5 strategies which seem to contribute to individual goals and then revise which concepts and their impact factors are relevant to these strategies.

4 CONCLUSIONS

In order to understand which elements can affect the readiness of teachers to use technology in performing teaching processes, we analysed the application of digital technologies in teaching, based on academic publications. Our concept-based impact systemization showed organizational and individual factors reported in reviewed literature. The limitation of our literature review is related to the relatively low number of publications found in selected research platforms, which can be associated to the dynamics of new publication inclusion.

Based on the systemized impact factors, we proposed a model for developing strategies for raising the readiness for using digital technologies in teaching processes, which consists only of impacts factors found in the analysis. It can be used as a template for developing personal agendas by identifying more institution specific factors.

REFERENCES


