FACTORS OF ACCEPTANCE OF DIGITAL TOOLS: THE EXAMPLE OF THE 3DEXPERIENCE PLATFORM IN THE CONTEXT OF COLLABORATIVE PROJECTS

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ABSTRACT

In face of the omnipresence of digital technology in all aspects of life, education and training players are encouraged to adapt to digital tools. This should enable learners to grasp and take advantage of the potential it offers, while developing the various dimensions of digital skills. However, the introduction of digital tools in education and training environments still raises many challenges, especially because any new technology requires from all actors, teachers and learners in particular, a change in their habits and postures. This action research takes as a theoretical analysis framework the model of instrumental acceptance applied to information and communication technologies developed by Caron and Heutte (2017). It focuses on

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the factors of acceptance and use of a digital tool in general, in particular the 3DExperience platform, by learners involved in applied collaborative projects. It is based on several experiments carried out with students from ISAE-Supméca, a French engineering school, and other students from partner institutions as part of the EXAPP_3D educational research project. With a methodology that focuses on interpretative phenomenological analysis (Restivo et.al., 2018), it provides scientific support for the sometimes complex challenges of integrating new tools in engineering schools.

1 INTRODUCTION

ISAE-Supméca has been involved in educational research for a decade through concrete students' projects involving several stakeholders, from industrial partners to academic partners. In the global framework of the integration of technological tools in the world of education and training in order to improve the transversal skills of learners thanks to the opportunities offered by information and communication technologies, ISAE-Supméca has been introducing for years the 3DExperience platform (Dassault Systèmes).

Several students' projects use this tool as a support and learning tool for the management of collaborative engineering projects and gaining a feedback about their use is of concern and interest, especially in the framework of collaborative projects realized within the EXAPP_3D project[2].

It is therefore in this context of increased use in the process of training learners that this study is located. This work highlights the first results of a qualitative study carried out with ISAE-Supméca students. Our research is essentially focused on the use of the 3DExperience platform. This work with a comprehensive aim seeks to analyse the real uses of the tool and the conditions of its appropriation by the learners.

After a broad review of the theoretical frameworks, we present the context of the study, the characteristics of the target population and the methods of collecting and analysing data. Finally, we present the results of our analysis and conclude.

2 THEORITICAL FRAMEWORK

The explanatory factors for the successful use and integration of technological tools in an educational context have been the subject of many studies in recent decades. The scientific literature indicates the existence of a variety of models to account for the integration of digital tools in teaching (Fievez, 2017; Bauchet et al. 2020) [1] [2].

[2] EXAPP_3D (Experiment Learning by Problems and Projects via 3D Design) is an ongoing so-called e-FRAN project coordinated by ISAE-Supmeca and co-funded by the French Fund Deposits, from September 2016 to December 2022. Among other things, the project aims to promote active learning involving students from secondary school and/or high school and/or Bachelor's degree and/or engineering school in common dedicated projects.

Bobillier-Chaumon and Dubois (2009) [3] group them into three main categories, including theoretical models of the social acceptance of Information and Communications Technology (ICT).

Social acceptance basically refers to the way individuals behave when faced with the introduction of new technologies in both their professional and domestic lives.

Overall, we can distinguish four different approaches to the social acceptance of ICT. We will be particularly interested in the technology acceptance model (TAM) modelled by Davis (1986) [4] during his doctoral research at IBM. It has indeed its roots in social psychology and is inspired by Fishbein and Ajzen's Theory of Reasoned Action (TRA) (1975) [5].

2.1 Theory of Reasoned Action

The TRA rejects the idea that the actions of individuals are underpinned by unconscious, capricious and unpredictable motivations. Thus for Fishbein and Ajzen (1975) [5] human beings consider the implications of their actions before deciding whether or not to engage in them. "Behavioural intentions are indications of an individual's willingness to perform a behaviour" (Fishbein and Ajzen, 2010, p. 39) [6]. Therefore TRA is based on the assumption that behaviour (the adoption of new technology, for example) is under the total control of the individual (Giger, 2008) [7].

This theory analyses the intentions of using a tool based on three social determinants:

- the attitude, which refers to a set of values and beliefs, which leads a user to evaluate favourably or not the fact of adopting new technologies,
- the subjective norm corresponds to the social influence or the social pressure perceived by the individual to adopt the tools (perception of the expectations of others),
- the degree of motivation of the subject to comply, to follow or not the incentives for adopting the tool.

The theory of planned behaviour proposed by Ajzen (1991) [8] is an extension of the theory of reasoned action by adding a new component: perceived behavioural control (perceived self-efficacy, expectation of success).

Both of these theories hold that social behaviour is eminently voluntary, because it implies a choice based on deliberation (Ajzen & Fishbein, 1980) [9].

2.2 Technology Acceptance Model

The Technological Acceptance Model (TAM) of Davis (1986) [4] was inspired by the work of Fishbein and Ajzen (1975) [5] by taking up the variables of the Theory of Reasoned Action (TRA) to which he integrates new elements.

The TAM postulates that attitude in forming the intention to accept a technology is based on two fundamental determinants: perceived usefulness and perceived ease of use. Davis, Bagozzi and Warshaw (1989, p. 985) [10] state that the perceived usefulness refers to “the prospective user’s subjective probability that using a

specific application system will increase his or her job performance within an organizational context" and the perceived ease of use refers to "the degree to which the prospective user expects the target system to be free of effort". Thus, according to this model, the perception that individuals have of usefulness and ease of use determines their attitudes and subsequently their behaviours in the use of technologies (Brangier, Hammes-Adelé & Bastien, 2010). [11]

The TAM had a resounding success and is even considered to be the dominant model for studies on the acceptability and adoption of ICT (Sanghee et al. 2013) [12].

Thanks to this success, other derivative models have been developed, integrating a multitude of external and moderating variables.

Faced with the diversity of enrichments to which the TAM has been subjected, Venkatesh et al. (2003) [13] proposed a "Unified Theory of Acceptance and Use of Technology (UTAUT)" from a synthesis of several behavioural models to explain the use of technology.

2.3 The instrumental acceptance model applied to ICT

The UTAUT has made it possible to identify four determinants on which the intention to accept a technology is based; namely the performance expectancy, the effort expectancy, the social influence, and facilitating conditions.

Caron and Heutte (2017) [14] adopted this model by necessarily adapting it to their context of study. The authors use therefore these four direct indicators of the intention to use (performance expectancy, effort expectancy, social influence, facilitating conditions). They match respectively the first two indicators (performance expectancy, effort expectancy) to the utility and usability dimensions. In order to understand the use of the prescribed tool, they propose that the perception of utility is broken down into the perception of general utility and projected utility. Their adaptation of the technology acceptance model is presented hereafter.

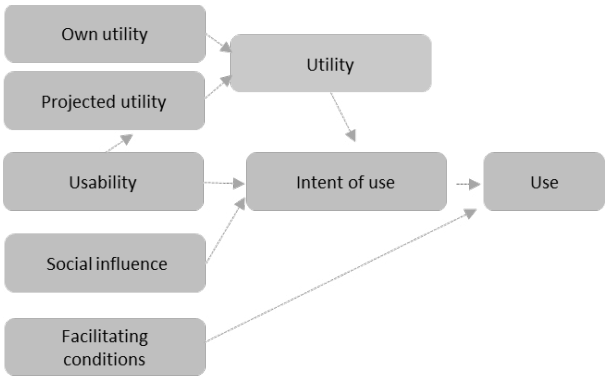

Fig. 1. The instrumental acceptance model applied to ICT (Caron and Heutte, 2017) [14]

The self-utility concerns the learner's assessment of the usefulness of the tool for him/herself. The projected usefulness concerns the learner's projection of the usefulness of the tool for his future, professional activities (in the context of this study, it is about the learners' perceptions of the requirement of mastery of the tool

for professional issues). The usability is linked to design, efficiency and satisfaction. According to Davis (1986) [4], it influences utility. The social influence and the facilitating conditions are intended to address the use of the device in its context, by evaluating the social reasons and the conditions (institutional, environmental in the broad sense, etc.) pushing to use the tool.

3 OUR STUDY

3.1 The context

ISAE-Supméca being a French engineering school involved since many years in problem-and project-based learning (PBL) and in educational research, many issues emerged at the confluence of research and practice. Our study is therefore positioned at this confluence, in other words, in a space that meets “both the challenges of knowledge and those of action” (Carré, 1998) [15].

This work was carried out as part of an evaluation following the implementation of the EXAPP_3D project led by ISAE-Supméca and involving several academic and professional actors. This educational project uses the PBL approach in the training of engineers, based on the most innovative digital chain tools, in particular the systems and collaborative animation modules of the 3DExperience from Dassault Systèmes. 3DExperience is a platform that has the advantage of capturing all the activities of an organization and its partners in one place. The use of this tool aims on the one hand to promote greater interactivity and learning of collaborative work in project mode by using digital as an opening to new actors and new know-how for our learners. On the other hand, it promotes the development of monitoring strategies, methods and support tools by and for teachers using digital as a teaching tool.

The objective of our work is to assess the contribution of the project as a whole to pedagogy and its impact on the development of learners' skills.

We will only report here on part of this work: based on a qualitative study, we questioned the feelings of learners about the contribution of digital technology and mainly the use of the 3DExperience platform in the context of collective projects they had carried out.

3.2 Population of our study

We contacted the learners from the 2021-2022 class of ISAE-Supméca who worked on collaborative projects with partners and involving the use of the 3DExperience platform in order to obtain their active collaboration in this research work, through a personal interview. Among the people contacted, 6 showed their interest in participating in the project. We were finally able to interview 4 people, 3 men and 1 woman, from 22 to 24 years old. The concerned learners all used the 3DExperience platform for the first time during the project period, as this use is for the moment experimental for students within some PBL modules, especially in the framework of EXAPP_3D. So, our study is a first qualitative approach of students’ feedback and complements another study published in 2021 [16]. The limited number of people in the sample makes this study an example that cannot be generalized.

3.3 Data collection and methodology

Data collection began with a phase of observations in contexts. It aimed to better understand the overall portrait of learners and their training environment. This ethnographic approach, which consists of observing in contexts, was omnipresent throughout the investigation. Subsequently, a corpus of 6 semi-structured interviews was collected from ISAE-Supméca learners who had worked with the aforementioned platform. Proceeding with semi-directive interviews allowed us to give an orientation to the discussions with regard to the main themes of our research while leaving the necessary latitude to the interviewees for the nuance and explanation of their positions (Michelat, 1975) [17]. We were interested in analysing the conditions of use of a tool, the 3DExperience platform, among learners. The method that seemed suitable for capturing the observed phenomenon is induction.

For data processing, we used interpretative phenomenological analysis, a method proposed by Restivo et al. (2009) [18]. Thematic analysis was also used during this step. It consisted of identifying, story by story, the themes addressed, checking their recurrence from one interviewee to another. The thematic analysis was done using RQDA software. This tool allowed us to automate the identification and extraction of themes (coding) from each story. Coding facilitates the work of comparison because it allows the connection of passages dealing with the same subjects. Our corpus of texts was therefore imported into RQDA in order to carry out this thematic coding.

4 RESULTS

In this part, we present our results according to four categories: general utility, usability, social influence and digital environment of the institution.

4.1 General utility

The data analysis shows a positive perception of the usefulness of the 3DExperience from all the interviewees. They generally recognize the indispensability of this tool for certain aspects of their work, in particular the collaborative aspects given the geographical dispersion and the physical distance between all the actors involved. As a result, learners show a positive attitude to the use of the 3DExperience. For them, the tool is “very practical” and has an undeniable advantage because they can do everything with it: easy access to the work of each member of the group, communication with academic and professional tutors, etc.

The use of the tool for their projects determines the usefulness they perceive of it. The 3DExperience platform arouses their interest in view of the results of the analyses.

However, they use it very sparingly. For them, use is limited to the scope of collective projects. This is a relatively short period (even if each student works around 200 hours, only 2 months are almost full time) during which learners primarily use the tools they master and use with their teachers. Indeed, as already stated, these learners involved in the study used the 3DExperience platform for the first time during this PBL period. ISAE-Supméca students use it for the moment only during

some projects modules, whereas all apprentices use it. So, one could argue that the use of this tool has a small impact on the general training of the learners of our study.

4.2 Usability

The 3DExperience is perceived as a complex tool because it brings together in a single place a set of 3D applications to which are added other functionalities that seem close to an educational platform. As a result, its usability is closely linked to it being used by our learners. The various functionalities of the platform are not mobilized in the same way according to the individual commitment of the students and their agency.

At the exception of students from one group, who used extensively the 3DExperience applications and used it for topology optimisation, our students mainly used it as file storage (access to resources) and communication (to a large extent) on the dashboard dedicated to the different groups and projects; to which only members have access. These uses are perceived as being very simple and intuitive. Thus, the majority of interviewees find the usability of the 3DExperience satisfactory. They then express a feeling of self-efficacy on these uses.

On the other hand, the design, optimization and simulation activities required self-training on the part of the students to improve their knowledge and have a greater mastery of the tool. It is here that the concept of agency used above finds its full meaning, insofar as it calls on the self-training activity of individuals as a self-directed learning process. Although all the learners expressed their training needs, the data show that only a few showed agency in implementing learning strategies to increase their effectiveness in using the tool through tutorials or other types of resources.

It could therefore be argued that the perception of the usability of the tool is variable and depends on the functionalities implemented, given the polymorphic nature and the richness of its functionalities.

4.3 Social influence

The social influence associated with the use of 3DExperience seems mainly linked to the injunctions received from academic and professional tutors and seems linked to a relative mastery of the tool on the part of the latter. The data analysis reveals that the interest given to the use of the platform was not the same in all the projects. In some cases, the use was perceived by the learners as an imposed or prescribed decision. The strategies for adopting the tool on the part of the interviewees were linked to their perception of the injunctions issued by the various tutors to use the tool. These learners perceive the first getting started tutorials provided by the tutors as a prescription for use. As a result, the deepening of the functionalities of the tool is nourished and supported by the connotations linked to the profile of the model learner, a determined individual-learner.

4.4 Digital environment of the institution

The analysis of the data brings out the theme of the institution's digital environment. It is present in the remarks of all the interviewees and concerns the digital tools used during their training. Their remarks are mainly structured around the determining elements put in place by the school in the training of students: the class, the courses, the modules.

The learners interviewed describe an environment that is not conducive to the full use of the tool set up for the projects. Indeed, as already stated, the 3DExperience tool provided for the projects is for the moment experimented only in several PBL modules and is not the subject of any training before the projects and is not used as a learning tool in any training module either (for the students, contrary to the apprentices in our institution). These results highlight the existence of a correlation between the discourse on the lived environment and the real practices of the learners during the projects. The use of the tool does not go beyond aspects perceived as intuitive and related to their digital skills. It could be argued that there is a strong correlation between the training received and the uses implemented. We note that the little training received in some groups thanks to tutorials from academic and/or professional tutors is positively correlated to the learners' feeling of self-efficacy and is the basis of the self-training strategies implemented.

5 CONCLUSION

At the end of this study, it appears that the 3DExperience platform is mainly used to access project resources, to store them and to provide access to them anywhere and at any time to other members of the work group. It is spontaneously used by all learners when it comes to communicating with other geographically distant actors and receiving feedback from their various tutors. On the other hand, it is often neglected when it comes to implementing more advanced functionalities such as design or simulation. In this sense, the functionalities that seem perceived as the most useful, even if more professional, are similar to that of an educational platform: space dedicated to each project where the project's resources are stored and are accessible, a space for coordination, mutual aid and communication between learners and between teaching staff/professional tutors and learners. It means that the real power of the tool was not really used during these projects.

The study highlights a discourse accounting for the uses of the platform and highlighting some components of instrumental acceptance (general utility, usability, social influence). It also makes it possible to understand that for learners, the in-depth use of a tool essentially involves institutional prescription, through training or the implementation of modules related to the skills for using the tool. Training in the perspective of supporting the appropriation of tools, even minimal, increases the sense of self-efficacy of learners and leads them to show agency.

Finally, we want to stress that we will use this feedback and then intend to conduct new studies like this one in the coming years, on broader samples, in order to be able to progressively implement more gradual changes.

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