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Exploring Students' Perspective of a Platform for Digital Competence Acquisition in Schools

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Abstract

This study aims to evaluate the ways that the actual usage of a platform for digital competence acquisition, evaluation and certification contributes to satisfaction and perceived success of students in primary and secondary schools. A cross-sectional survey was implemented online to collect 1725 students' answers in six European countries. The analysis of collected data was carried out by employing Pearson correlation, Partial least squares structural equation modelling (PLS-SEM) and Importance-performance map analysis (IPMA). Findings indicated that the usage of such a platform has greater effects on the impacts than on students' satisfaction. Detailed analysis of correlations revealed that students' decision on whether they will use the platform in the future greatly depends on how it contributes to the success of their learning processes. Results also suggest that teachers are seen as an inevitable part of such a process and are mandatory to achieve the full potential of the platform.

Keywords: User satisfaction, net impacts, system use, Delone and Mclean information systems success model, digital competence, importance-performance map analysis

1. Introduction

Today, a young person needs to acquire a set of digital skills most commonly represented as digital competence (DC) to be able to enter the labour market without the risk of exclusion. The literature review has shown that the best solution for students to acquire DC is to integrate them into the formal educational curriculum [1], [2]. This is further supported by [3]–[6] who suggest that education and evaluation of DC should be started from the earliest age of students and promoted throughout the curriculum. That way, schools could timely identify the lack of a specific DC and intervene with a certain plan of development. However, very few studies have been reported to deal with the evaluation of DC at any level of education, especially in primary and secondary education. A three-year longitudinal study [7] concluded that digital skills do not develop equally over the years of education, e.g. creating information skills has been developing most slowly.

With that respect, an EU funded research project CRISS has been established to develop an online platform (hereinafter referred to as CRISS DC platform) for DC acquisition, evaluation and certification in primary and secondary schools. The platform is based on a newly developed framework [8] that decomposes DC into five areas and twelve sub-competences. Each sub-competence is composed of a set of performance criteria that translate the sub-competences into more specific elements of what a student should be able to demonstrate. Teachers are responsible to plan the learning, providing feedback and evaluating activities and tasks that relate to an individual sub-competence. The activities and tasks are retrieved by the CRISS repository and teachers can apply them with or without further adaptations. The students should conduct the activities by performing one or more tasks and generate evidence to prove the acquisition of a specific sub-competence. The evaluation of digital (sub-)competence is also performed through the CRISS DC platform with two types of interventions: human and technological. Human interventions are carried out by teachers and students using tools like Rubrics, Check Lists, Scales, etc., that are automatically generated by the CRISS DC platform and customized by teachers. The technological intervention is executed by the platform automatically which is set to track the students while working in their assigned activities and to collect relevant information i.e., the indicators of the evidence evaluation. The CRISS DC platform as such has been piloted in six European countries (Spain, Sweden, Croatia, Greece, Romania and Italy) for several months during the school year 2018/2019 with a targeted population of students over 9 years of age.

The main aim of this study is to investigate how the actual use of such a platform contributes to satisfaction and perceived success of students in primary and secondary schools.

2. Research Focus

Although recent research findings [9], [10] suggest that teachers are the main drivers for the incorporation of DC evaluation and certification into curricula, students are the ones who need to benefit from that process. In that sense, educational systems face a significant challenge to provide their users with an effective learning experience. Outcomes of interaction are most visible after extensive time and effort invested in learning on behalf of students. Therefore, it is up to a system to provide students with an engaging experience to achieve sustainability goals.

Studies have found that students who are satisfied with the system will use it more frequently [11]. Furthermore, students that could successfully interact with each other and had various ways of learning evaluations within the system were more satisfied [12]. Students' perception of content structure, functionalities and navigation will also impact their satisfaction and use. The system success will be a result of students' perceived benefits and attitudes towards the system. With that respect, the following hypotheses are proposed (see Figure 1):

H1. System use has a positive effect on User satisfaction.
H2. System use has a positive effect on Net impacts.
H3. User satisfaction has a positive effect on Net impacts.

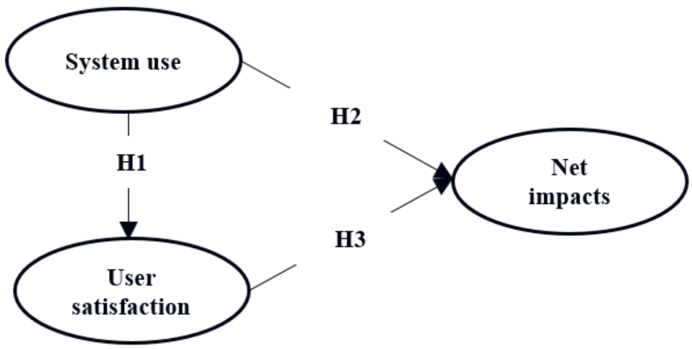

Figure 1. Hypothesized model

Overall, this study is focused to contribute to future academic research and advancement in the field of DC platform development.

3. Method

This section describes the research participants who have actively used the CRISS DC platform during the implementation of the CRISS project. The procedure of data collection, which was performed online in primary and secondary schools, is also described. Data was collected with the survey that is based on the well-known DeLone and McLean Information Systems Success Model. Survey items were adapted to primary and secondary school students and translated into the official languages of the countries where it was administered.

3.1. Participants and Data Collection

Students from primary and secondary schools were selected as they were active users of the CRISS DC platform for at least one month. It is assumed that those students had sufficient time to get familiar with the platform to properly assess it.

The total number of students enrolled in the CRISS DC platform during the school year 2018/2019 was 7543. Of these, 1725 students (47% boys and 53% girls) aged from 9 to 20 years (M = 14.91; SD = 1.83) participated in the research between May and September 2019. Seventy-one percent of them attended secondary and 29% primary schools located in six European countries. Most students were from Croatia

(41.6%), then from Spain (26.7%), Greece (12.3%), Italy (4.8%), Romania (6.7%) and Sweden (7.8%).

Data collection was conducted using an online survey which was administered by teachers during the class to clarify possible doubts of students in certain questions and to achieve the highest response rate possible on behalf of this study's authors. Teachers were instructed to explain briefly to students the purpose of filling out the survey and to ask them to carefully read questions. The participation of students was voluntary and anonymous. The survey was distributed with LimeSurvey online tool that was set not to collect personal data or track IP addresses.

For this research, the judgement sampling approach was based on the selection of teachers with whom continuous communication was established during the project and who were believed to survey students during their classes. The response rate was 22.9% which is in line with the findings that showed that the average response rate in online surveys ranges between 20% and 47% [13].

3.2. Research Instrument

To assess and identify the most relevant variables of students' satisfaction, use and impacts of the CRISS DC platform we used three constructs from the DeLone and McLean Information Systems Success Model revised in 2016 [14]. The first construct, User satisfaction measures users' level of satisfaction with reports, platform, and support services. The second construct, System use measures the feedback on using the capabilities of the CRISS DC platform. The third construct, Net impacts measures the extent to which the platform contributes to the success of users. User satisfaction, System use and Net impacts are measured with five, eight and twelve items, respectively.

The instrument development phase was conducted by following the recommendations of several prominent scholars [15]–[17]. We started with the operationalization of research constructs based on the existing measures and modified it with a set of new target-specific measures. Content validity was ensured, besides using an extensive literature review, by using focus groups that involved experts in the field of pedagogy, e-learning, assessment, and teaching methodology. The final measurement instrument (see Table 1) was translated into all target languages of students. Students could record their answers on a five-point Likert-type scale, ranging from 1 (strongly disagree) to 5 (strongly agree).

The survey aimed to examine students' satisfaction, their use of the platform, and their success during the acquisition and evaluation of DC.

Code	Items – SYSTEM USE
SU1	I would like to use the CRISS platform again in the future
SU2	I have all the necessary equipment to use the CRISS platform (e.g. computer/tablet/mobile phone, internet connection).
SU3	I use the CRISS platform to organize and publish my work (ePortfolio).
SU4	I use the CRISS platform to work with other students (teamwork).
SU5	I use the CRISS platform features to tag my work (e.g. homework, seminar, project, images, videos, etc.).

SU6	I use the CRISS platform to see my progress and achievements (grades, badges, etc.).
SU7	I use the CRISS platform to see the progress of other students.
SU8	I use the CRISS platform to communicate with my teacher(s).
Code	**Items – USER SATISFACTION**
US1	I like using the CRISS platform
US2	I find the CRISS platform useful for my learning
US3	I think it is interesting to use the CRISS platform
US4	I feel confident using the CRISS platform
US5	I am satisfied with the CRISS platform possibilities
Code	**Items – NET IMPACTS**
NI1	The tasks in the CRISS platform enable me to be creative in solving them (ingenious, original).
NI2	The CRISS platform makes my learning easier.
NI3	The CRISS platform helps me to see my progress.
NI4	Seeing my progress helps me to improve my learning.
NI5	Earning badges motivates me.
NI6	The CRISS platform helps me to develop new skills (making presentations, sharing my work, finding information on the Internet, online communication ...).
NI7	Within the CRISS platform I easily understand how my work is being assessed.
NI8	I get feedback from my teacher more quickly with the CRISS platform.
NI9	The CRISS platform enabled me to show my work in a more attractive way(s) (e.g. my presentations are more visible and organized/my videos can be accessed easily/I can use portabily to show my different works…).
NI10	The CRISS platform enables me to participate in my assessment (i.e. self-assessment, my comments to the teacher).
NI11	The time spent on activities has been useful to learn.
NI12	When I work in the CRISS platform, I realise the process I follow to solve the tasks.
Notes. Answers on a five-point Likert-type scale (1 – Strongly disagree; 2 – Disagree; 3 – Uncertain; 4 – Agree; 5 – Strongly agree; NA – not applicable).	

Table 1. Survey instrument

4. Results

Descriptive statistics and correlations between variables were calculated using R [18]. Additionally, data were examined using the partial least squares structural equation modelling (PLS-SEM) in SmartPLS 3 [19]. This multivariate analysis is suitable for theory building, providing causal explanations and when there are concerns about data distribution [20].

In that sense, the psychometric properties of constructs in the outer (measurement) model were analysed, and relationships between three proposed latent variables were observed in the inner (structural) model. The significance of relationships was assessed using bootstrapping of 5000 samples and a critical t-value of 1.96 for $p < 0.01$.

Finally, the importance-performance map analysis (IPMA) was used to bring more insight into the impact of exogenous constructs on the target construct (Net impacts) in the model.

4.1. Descriptive Statistics and Pearson's Correlation

The analysis of collected data showed that most students were between 14 and 17 years old (80.5%). Only 2% of students reported being older than that. During the school year 2018/2019, students used the CRISS DC platform every day (1.9%), almost every day (9.9%), at least once a week, but not every day (47.3%), at least once a month, but not every week (25.3%) and never or almost never (15.5%). Their experience of using the system outside school, but also the use frequency of other digital technologies for learning is shown in Table 2.

The mean values at construct levels are 2.79 (*SD*=1.55) for System use, 2.71 (*SD*=1.48) for User satisfaction and 2.80 (*SD*=1.52) for Net impacts. As expected, the median value for all three question categories is 3.00 which indicates the mostly uncertain perception of system use, satisfaction and its impact.

Possible answers	a. (%)	b. (%)	c. (%)	d. (%)
Never or almost never	46.9	7.9	6.8	36.6
At least once a month, but not every week	20.6	19.1	19.2	16.8
At least once a week, but not every day	26.8	35.1	27.7	17.6
Almost every day	4.9	23.9	28.2	14.4
Every day	0.8	14.1	18.1	16.6

a. Use of CRISS platform outside the school timing.
b. I use digital technologies in school related to schoolwork (e.g. assignments, communication with other students or communication with teachers).
c. I use digital technologies at home related to schoolwork (e.g. assignments, communication with other students or communication with teachers).
d. I use digital technologies outside the school for learning that is not related to school (e.g. robotics or computer classes).

Table 2. Descriptive statistics of use frequency ($N = 1725$)

Table 3 displays a summary of the mean and standard deviation of students' responses for each item. Furthermore, survey responses "5 - strongly agree" and "4 - agree" are combined within column "Agree", column "Neutral" represents all "3 - uncertain" answers while "1 - strongly disagree" and "2 - disagree" are combined within column "Disagree".

Items	Mean (Std. dev)	Agree (%)	Neutral (%)	Disagree (%)
SU1	2.41 (1.47)	467 (27%)	334 (19%)	924 (54%)
SU2	3.96 (1.33)	1311 (76%)	176 (10%)	238 (14%)
SU3	2.86 (1.53)	728 (42%)	345 (20%)	652 (38%)
SU4	3.10 (1.48)	877 (51%)	290 (17%)	558 (32%)
SU5	2.65 (1.49)	586 (34%)	397 (23%)	741 (43%)
SU6	2.74 (1.50)	664 (38%)	329 (19%)	732 (42%)
SU7	2.30 (1.47)	428 (25%)	303 (18%)	994 (58%)
SU8	2.33 (1.39)	415 (24%)	337 (20%)	973 (56%)
US1	2.47 (1.48)	514 (30%)	343 (20%)	868 (50%)

US2	2.75 (1.45)	643 (37%)	352 (20%)	730 (42%)
US3	2.73 (1.50)	635 (37%)	340 (20%)	750 (43%)
US4	2.76 (1.50)	655 (38%)	352 (20%)	718 (42%)
US5	2.84 (1.47)	683 (40%)	359 (21%)	683 (40%)
NI1	2.95 (1.44)	721 (42%)	399 (23%)	605 (35%)
NI2	2.61 (1.43)	528 (31%)	424 (25%)	773 (45%)
NI3	2.81 (1.49)	683 (40%)	365 (21%)	677 (39%)
NI4	2.91 (1.52)	732 (42%)	367 (21%)	626 (36%)
NI5	2.46 (1.66)	560 (32%)	353 (20%)	812 (47%)
NI6	3.02 (1.49)	783 (45%)	381 (22%)	561 (33%)
NI7	2.94 (1.52)	753 (44%)	352 (20%)	620 (36%)
NI8	2.67 (1.55)	627 (36%)	363 (21%)	735 (43%)
NI9	2.82 (1.54)	678 (39%)	399 (23%)	648 (38%)
NI10	2.7 (1.52)	618 (36%)	429 (25%)	677 (39%)
NI11	2.83 (1.52)	695 (40%)	361 (21%)	669 (39%)
NI12	2.93 (1.50)	755 (44%)	346 (20%)	624 (36%)

Table 3. Aggregated survey response of students ($N = 1725$)

The mean of answers for System use fluctuates from 2.30 (SU7) to 3.96 (SU2). The highest standard deviation was reported for item SU3 (1.53) regarding the organization and publication of students' work via ePortfolio. In the satisfaction category, item US5 has the highest mean value of 2.84 and US3 the lowest (2.73).

Items NI6, NI1, NI7 and NI12 have the highest mean values of 3.02, 2.95, 2.94 and 2.93, respectively. The lowest mean value is reported for NI3 (2.81). Although, there are many items that students disagree with, here we will single out items with a higher percentage of positive responses – SU2, SU3, SU4, NI1, NI3, NI4, NI6, NI7, NI9, NI11 and NI12.

The Pearson correlation coefficient is calculated for variables across three constructs and results are interpreted according to Evans [21]: 0.00 - 0.19 (very weak), 0.20 - 0.39 (weak), 0.40 - 0.59 (moderate), 0.60 - 0.79 (strong) or 0.80 - 1.0 (very strong). The significance of correlations among the variables is tested at $p<0.01$.

In Table 4, there is a very strong and significant relationship between SU1 and US1 (r=0.86; $p<0.01$) indicating that students who like to use the platform would like to use it in the future as well. Variable SU2 has weak, although significant relationships ($p<0.01$) with all the other satisfaction variables. Although the correlation between SU1 and US3 is fairly large, it is not significant ($p>0.05$), so there is a high chance this relationship does not exist in the population. All other relationships in Table 4 are moderate to strong and significant ($p<0.01$).

	US1	US2	US3	US4	US5
SU1	**0.86**	**0.76**	0.80**	**0.67**	**0.74**
SU2	0.26	0.32	0.30	0.34	0.34
SU3	**0.60**	**0.63**	**0.64**	0.58	**0.63**
SU4	0.48	0.53	0.51	0.47	0.53

SU5	0.58	**0.60**	**0.60**	0.54	**0.62**
SU6	**0.66**	**0.66**	**0.67**	**0.60**	**0.68**
SU7	**0.60**	**0.60**	**0.60**	0.54	**0.60**
SU8	**0.62**	**0.63**	**0.60**	0.54	**0.60**
Notes. All correlations are significant at the 0.01 level (2-tailed); **except between the variables SU1 and US3. Bold correlations are considered 'strong' or 'very strong'.					

Table 4. Correlations between System use (SU) and User satisfaction (US)

In Table 5 there are numerous moderate to strong and significant relationships (*r* between 0.40 and 0.79; p<0.01). Variable SU2 has only one moderate and significant relationship with the NI1, while all others are weak (*r* between 0.29 and 0.39), but significant.

	SU1	**SU2**	**SU3**	**SU4**	**SU5**	**SU6**	**SU7**	**SU8**
NI1	**0.71**	0.41	**0.67**	0.56	**0.64**	**0.69**	**0.61**	0.59
NI2	**0.74**	0.30	**0.63**	0.55	**0.65**	**0.71**	**0.65**	**0.67**
NI3	**0.70**	0.35	**0.65**	0.56	**0.68**	**0.75**	**0.64**	**0.65**
NI4	**0.67**	0.30	**0.61**	0.48	**0.61**	**0.68**	0.59	**0.60**
NI5	**0.68**	0.29	0.59	0.49	**0.63**	**0.68**	**0.62**	**0.60**
NI6	**0.67**	0.39	**0.62**	0.54	**0.62**	**0.67**	0.58	0.58
NI7	**0.64**	0.39	**0.61**	0.51	0.59	**0.65**	0.59	0.56
NI8	**0.65**	0.31	**0.60**	0.51	**0.60**	**0.66**	0.59	**0.61**
NI9	**0.72**	0.36	**0.66**	0.57	**0.66**	**0.72**	**0.67**	**0.64**
NI10	**0.68**	0.34	**0.65**	0.54	**0.65**	**0.70**	**0.65**	**0.64**
NI11	**0.75**	0.31	**0.63**	0.54	**0.62**	**0.71**	**0.64**	**0.64**
NI12	**0.71**	0.39	**0.64**	0.55	**0.61**	**0.68**	**0.62**	**0.63**
Notes. All correlations are significant at the 0.01 level (2-tailed). Bold correlations are considered 'strong' or 'very strong'.								

Table 5. Correlations between System use (SU) and Net impacts (NI)

4.2. Measurement Models

PLS-SEM is adopted in this study to estimate the reliability and validity of obtained data as shown in Table 6. In a measurement model, almost all loadings were above acceptable 0.70 which suggests that the construct explains more than 50 percent of the variance of a given indicator [20]. The exception was indicator SU2 with the loading of 0.39 which is dropped from further analysis. Internal consistency reliability of each latent variable is measured in terms of Cronbach's Alpha (CA) and Composite Reliability (CR). The results of latent variables were higher than 0.70 in both cases which is a preferred cut-off for reliability [20]. The convergent validity was estimated with Average Variance Extracted (AVE) which should be above 0.50 to be acceptable [22]. In this study, the AVEs ranged from 0.57 to 0.76 showing that the most variance is captured by User satisfaction indicators.

To ensure the discriminant validity of the measurement models, the Heterotrait-Monotrait criterion (HTMT) was applied [23] and shown in Table 7. The HTMT criterion indicates that all variables are distinctively different at 0.90 as a targeted limit acceptable. All values are below the determined threshold beside User satisfaction which is on the borderline with the value of 0.90 and therefore the bootstrapping procedure was taken as suggested by Hair et al. [22]. The re-assessment showed that the HTMT confidence intervals (97,5%) do not contain the value of one which would indicate the lack of discriminant validity. By that, we can conclude that the variables are appropriately distinctive from one another, and discriminant validity is established.

<table>
<tr><th rowspan="2">Latent Variable</th><th rowspan="2">Indicator</th><th rowspan="2">Loading</th><th colspan="2">Internal Consistency Reliability</th><th>Convergent validity</th></tr>
<tr><th>CA</th><th>CR</th><th>AVE</th></tr>
<tr><td rowspan="7">System use</td><td>SU1</td><td>0.75</td><td rowspan="7">0.88</td><td rowspan="7">0.90</td><td rowspan="7">0.57</td></tr>
<tr><td>SU3</td><td>0.75</td></tr>
<tr><td>SU4</td><td>0.70</td></tr>
<tr><td>SU5</td><td>0.75</td></tr>
<tr><td>SU6</td><td>0.81</td></tr>
<tr><td>SU7</td><td>0.77</td></tr>
<tr><td>SU8</td><td>0.76</td></tr>
<tr><td rowspan="5">User satisfaction</td><td>US1</td><td>0.88</td><td rowspan="5">0.92</td><td rowspan="5">0.94</td><td rowspan="5">0.76</td></tr>
<tr><td>US2</td><td>0.88</td></tr>
<tr><td>US3</td><td>0.90</td></tr>
<tr><td>US4</td><td>0.82</td></tr>
<tr><td>US5</td><td>0.88</td></tr>
<tr><td rowspan="12">Net impacts</td><td>NI1</td><td>0.81</td><td rowspan="12">0.95</td><td rowspan="12">0.95</td><td rowspan="12">0.63</td></tr>
<tr><td>NI2</td><td>0.84</td></tr>
<tr><td>NI3</td><td>0.84</td></tr>
<tr><td>NI4</td><td>0.76</td></tr>
<tr><td>NI5</td><td>0.74</td></tr>
<tr><td>NI6</td><td>0.80</td></tr>
<tr><td>NI7</td><td>0.77</td></tr>
<tr><td>NI8</td><td>0.75</td></tr>
<tr><td>NI9</td><td>0.80</td></tr>
<tr><td>NI10</td><td>0.79</td></tr>
<tr><td>NI11</td><td>0.84</td></tr>
<tr><td>NI12</td><td>0.81</td></tr>
</table>

Table 6. Convergent validity and reliability.

Variables	**Net impacts**	**System use**	**User satisfaction**
Net impacts			
System use	0.89		
User satisfaction	0.90	0.85	

Table 7. Discriminant validity following HTMT.

4.3. Structural Model

The structural model represents (inner) relationships among constructs [24]. First, the predictor constructs, System use and User satisfaction, were examined for the Variance Inflation Factor (VIF). Results in Table 8 have not found any collinearity issues given that the cut-off value of three has not been exceeded [22].

Variables	Net impacts	System use	User satisfaction
System use	2.51		1.00
User satisfaction	2.51		

Table 8. Inner VIF values.

Next, the coefficient of determination for endogenous variables (R^2) and their predictive relevance (Q^2) were estimated to interpret the explanatory power and predictive accuracy of the structural model [20].

The R^2 of 0.67, 0.33 and 0.19 are considered substantial, moderate and weak, respectively [25]. Table 9 shows acceptable R^2 values meaning that 78 percent of the variance in Net impacts is explained by System use and User satisfaction, while 60 percent of the variance in User satisfaction is explained solely by System use. Regarding Q^2 in Table 9, the cut-off values of 0, 0.25 and 0.5 explain a small, medium, and large predictive accuracy of the paths in the model [20]. Obtained results suggest medium predictive relevance of exogenous constructs on the associated endogenous constructs.

The effect size (f^2) of 0.02 signifies a small effect, 0.15 a medium effect, and 0.35 a large effect [22]. Table 10 shows that System use on Net impacts has a medium effect, while User satisfaction has a large one. However, the largest effect has System use on User satisfaction.

The structural model with results shown in Table 11 and Figure 2 is significant for all three hypothesized paths with a p-value less than 0.01.

Variables	R^2	Results	Q^2	Results
Net impacts	0.78	Substantial	0.49	Medium
User satisfaction	0.60	Moderate	0.46	

Table 9. R^2 and Q^2 of endogenous latent variables.

Variables	Net impacts	System use	User satisfaction
System use	0.29		1.51
User satisfaction	0.52		

Table 10. The f2 effect sizes.

Hypothesized path	Standardized coefficients (β)[a]	SD[b]	t-values[c]	p-values[d]	Result
H1. System use → User satisfaction	0.78**	0.01	68.82	0.00	Supported
H2. System use → Net impacts	0.40**	0.02	16.41	0.00	Supported
H3. User satisfaction → Net impacts	0.54**	0.02	22.19	0.00	Supported
Notes. [a] Bootstrapping(c) with 5,000 samples (two-tailed test); [b] Standard deviation (SD); [c] t>1.96 (sig. level=5%); [d] **p<0.01.					

Table 11. Summary of the structural model and hypotheses testing

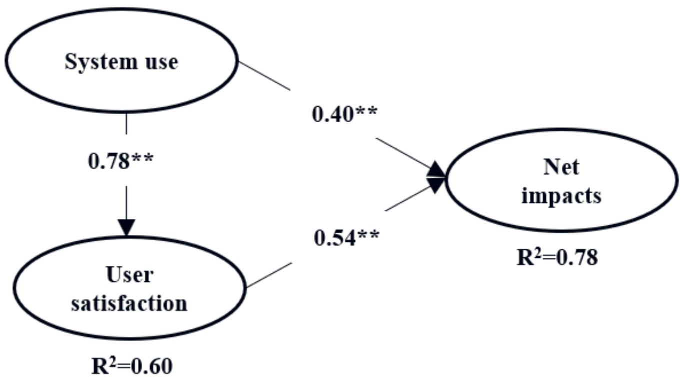

Figure 2. Structural model (**p<0.01)

4.4. Importance-Performance Map Analysis

To complement PLS-SEM results and reported path coefficients, we have used the importance-performance map analysis (IPMA) [22]. Additionally, it helped to explain the impact of exogenous constructs, namely – System use and User satisfaction, on the target construct, Net impacts.

Table 12 revealed that System use has a stronger total effect (a sum value of indirect and direct effects) over the Net impacts than User satisfaction. However, their performance values are the same. Figure 3 shows an importance-performance map divided into four quadrants which are determined according to Streukens et al. [26].

The mean value for the x-axis (importance) is 0.50, while the value of 50 is a midpoint of the 0-100 range for the y-axis (performance). The first quadrant comprises System use and that is interpreted as 'keep up the good work'. However, User satisfaction is in the middle of the first and fourth quadrant which is labelled as 'possible overkill'. Nevertheless, both predecessors have lower performance, but the

System use would have priority over User satisfaction for improvement because of its high importance for Net impacts.

Predecessor construct	Importance (Total effects)	Performance
System use	0.92	54
User satisfaction	0.50	54

Table 12. Summary of the IPMA for Net Impacts.

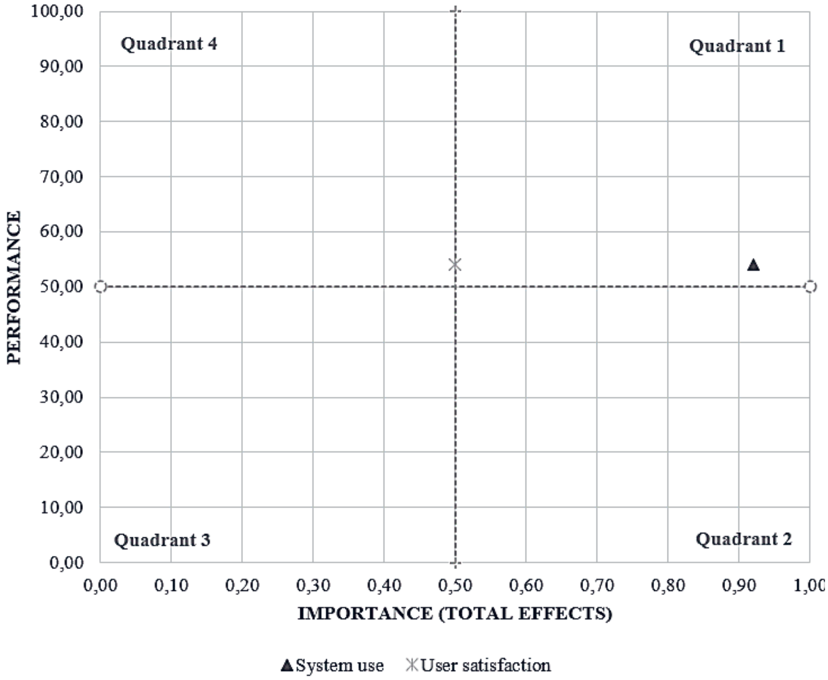

Figure 3. Importance-performance map of predecessor constructs

5. Discussion

Research results indicated that students were in general satisfied with the platform possibilities. They have mostly used the platform for teamwork purposes, and less to track the progress of their peers which may be one of the proofs that they are not as competitive as it is naturally assumed. Students recognized that the CRISS DC platform can help them to develop new skills such as making presentations, sharing their work, finding information on the Internet, communicating online, etc. Moreover, they claim it helped them to be more creative in solving the tasks. On the other hand, students did not seem to be especially motivated by earning badges within the platform. This can be due to different implementations of a digital competence acquisition across schools. Some schools only implemented one sub-competence scenario to try out the platform, so students and teachers might have not seen the real purpose of badges which was to efficiently track the progress across a variety of sub-competences. However, the digital competence acquisition and the platform are intended to be used throughout several grades/years which means that the final digital competence certificate could be earned throughout one, two or even three years within the formal curriculum, depending on the subjects in which DC assessment is integrated, number of scenarios, etc.

All these results consistently support the fact that a lot of research is needed in the field of implementing digital competences in the education of primary and secondary school students, as well as the tools that would support it.

Using Pearson's correlation when observing the relationship between students' use of the CRISS DC platform and their satisfaction, we did not find a statistical significance between students' decision to continue using the platform again in the future and whether they consider it to be interesting to use. On the other hand, their decision would be impacted by whether they like using the platform, found it useful for learning or feeling confident and satisfied while using it. Also, they would use ePortfolio for organizing and publishing their work because they have found it interesting. Furthermore, they can use the CRISS DC platform to tag their work and this seems like a satisfactory possibility. Overall, the platform gives them proper feedback which they like, consider useful, interesting and it boosts their confidence. It is interesting to observe that seeing the progress of their peers did not have a significant impact on their confidence which is in line with the previously stated findings on student competitiveness. The same conclusion is derived for their communication with teachers – it did not boost their confidence.

The correlation analysis of students' use of the CRISS DC platform and its impact on their work again confirmed some major findings such as the need to creatively express themselves and get proper feedback for it. Furthermore, students' decision to reuse the platform in the future would be impacted by all twelve listed net impacts, but the strongest ones are listed here: usefulness of spending time on the platform, easier learning, more attractive way of presenting solved tasks, insight into the process of solving the tasks, and others. Results confirmed that a possibility of tracking progress and achievements within the CRISS DC platform is making students' learning easier. Knowledge of what they have achieved in real-time gives them a sense of useful utilized time. Findings also confirmed the significant relationship between communication with teachers via the platform and students' easier learning.

Overall, students perceived the platform helpful in developing new skills and they could easily understand how their work is being assessed. Furthermore, they were able to be more creative in solving the tasks. On the other hand, students less considered earning badges as essential to their motivation to use the platform.

6. Conclusion

This investigated the relationship between user satisfaction, system use and net impacts of cloud-based infrastructure for acquisition, evaluation and certification of digital competence in primary and secondary education focusing on students' perspectives. According to our knowledge, the CRISS DC platform is the first attempt to create a comprehensive, cloud-based solution for digital competence acquisition, evaluation and certification in Europe, and to pilot such a solution within a formal curriculum of primary and secondary schools in six European countries.

The PLS-SEM analysis found the proposed model to be reliable and valid for the assessment of students' satisfaction, their use of the CRISS DC platform and their success. All hypothesized relationships were statistically significant supporting the proposed model.

It can be concluded that student confidence is a result of being able to check self-progress and achievements in real-time. It can also impact their decision to use the system again in the future. Whether they have the necessary equipment to use the platform will not affect their satisfaction because most of them have optimal requirements at school. The use of educational platforms can be improved if students consider it useful for their learning and if it has satisfactory possibilities. Future studies should analyse which possibilities students liked the most and practitioners could implement it as a baseline in future platforms.

Students' decision on whether they will use the system in the future greatly depends on how the platform contributes to the success of their learning processes, and not their direct satisfaction.

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