
USER PERCEPTIONS ON RELEVANCE OF A LEARNING MANAGEMENT SYSTEM: AN EVALUATION OF BEHAVIOURAL INTENTION AND USAGE OF SCIPRO SYSTEM AT UNIVERSITY OF RWANDA

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Abstract

With the emerging use of technological interventions in education systems, e-learning systems contribute immensely in education delivery. However, with substantial efforts from the Rwandan Government, there are still claims about the lack of online support systems especially for thesis process in Rwandan higher education. Furthermore, the experience has proved that some systems implemented at University of Rwanda have failed because the adoption is loath. Therefore, one of the reasons is that some innovative systems are fully diffused and deployed in the university without prior test to its future users to know the user behavioural intention from their perceptions in regard to a particular system. This study follows the introduction of one learning management system called “SciPro” and the aim of this study was to evaluate the future key users’ perceptions about the relevance of SciPro System in improving thesis process. Embedded Case study was used as a research strategy to collect data from 31 workshop participants using a questionnaire. Afterwards, convenient interviews were conducted at 5 colleges during and after testing some features and functionalities of SciPro System. Results show that future users express a reasonable level of intention and use of the system. They also appreciate the usefulness of SciPro resources at a higher level. Thus, on the other hand, one concludes that proposed customization of SciPro in accordance to Rwandan education system should be considered for some features such as peer review process and anti-plagiarism control functionalities. The study also reveals that there are other factors outside SciPro System, such as, management support, high-speed Internet access and motivation to innovators and early adopters that should be considered throughout the implementation process.

Introduction

Since the introduction of computer in everyday human life, there has been a dramatic change in the way activities are performed and the education sector has not escaped this phenomenon. Through the use of Internet and related technology, a wide range of learning management systems have been developed and according to Alkhatabi, Neagu and Cullen (2010), this trend has improved the teaching and learning activities in several higher learning institutions especially from developed countries. But the adoption and use of these innovative technologies depend mainly on the user behavioural intention, which is delivered by different expectations in regard to system resources and functionalities. Researchers such as Hansson et al. (2009) and Alexander (2001) have elucidated the role of information and communication technology (ICT) to improve the quality of education. Once implemented successfully and accepted by users, ICTs impact on the way online educational activities, such as thesis supervision process, are performed and on the quality of final submitted theses by both bachelor and master's students. A research by Archer, Garrison and Anderson (1999) reveals that the emergence of E-learning technologies intensely transformed traditional education systems in a disruptive way. ICT in education involves digital learning and this brings cohesiveness by removing barriers to both on campus and on distance learners. Furthermore, Anderson (2008) explored prior studies on E-learning technologies and summarized some of the associated benefits which include the increased access, removal of time, place and barriers, ability to provide just-in time learning, cost effectiveness, increased interaction, provision of future employment skills for learners, greater accountability and effective support for lifelong learning.

Although some universities recognize those advantages, there is still a noticeable lack of strong E-learning technologies in a number of universities from developing countries and particularly in Rwanda. Claims also go further by positing that some IT systems implemented some years ago have not attended envisioned objectives. This can be evidenced by claims from the academic community and the rest of Rwandan society that there is, for example a poor quality of theses produced by bachelor and master's students while as per the national mandate, research outcomes should improve people's lives. Various reasons for this phenomenon could be like the lack of easy access to some resources for students and supervisors, scarce time for supervision, high supervisor-student ratio and lack of anti-plagiarism systems among others.

From this perspective and with the aim to improve quality of education, different IT systems are implemented to support teachers, students and the rest of the academic community regardless of the education discipline. These IT systems, once well implemented, accepted and understood by users, they can assist universities to achieve their educational visions and aims. Coming back to the point of designed systems for supporting learning and teaching, Cohen and Nachmias (2011) stressed that though there is still a challenge to e-learning environments, but there are still innovative technologies coming up to improve communication and resource sharing to harmonize teaching and learning activities.

One of the technologies enhanced learning enabled by the fast technological developments is the online supervision system designed to help the academic community in producing quality theses at both undergraduate and postgraduate levels. With this technological innovation in thesis process, higher learning institutions such as Stockholm University's Department of Computer and Systems Science, DSV (Hansson, Collin, Larsson & Wettergren, 2010) for example, are currently using that system to enjoy benefits like collaborative learning, research information exchange with the rest of the society (industry, business, government and NGOs) and quality produced theses. This system improves access to e-resources and other learning materials, and increase flexibility by allowing students and supervisors to communicate anytime at any place thereby enabling self-paced and lifelong learning.

Nevertheless, it is worth to note that the degree of a particular artifact usage normally depends on the level of users' familiarity and how easy it is to use. This conceptual viewpoint is also supported by (Cowen, 2009; Davis, 1993; Jonscher, 1983) who contend that user attitude and acceptance of an IT system is an essential factor to gain productivity in a shorter time and with no additional financial investment. This assertion brings us to the point that universities should evaluate students and teachers' perceptions about the usefulness of a particular e-learning system before embarking on its full implementation. This being the case, it will lead to the system adoption, which as result improves work performance and effectiveness to add value to the overall university productivity.

Although there are various computer-supported learning systems to improve thesis supervision, the University of Rwanda has shown an interest to implement SciPro System in its new colleges to of help staff and students in different research activities. Prior to that, experience has proven that some systems implemented at this university to support e-learning activities have failed because users didn't use them effectively as intended by the university management. Therefore, with the aim of avoiding such phenomenon for SciPro system, the later is being tested to some teachers and e-learning coordinators to determine their behaviour intentions that lead to adoption and use and the associated value addition in improving thesis supervision process.

The empirical researches such as of (Hardrave & Johonson, 2003; Schewe, 1976; Venkatesh, Morris, Sykes & Ackerman, 2004; Chau, 2001; Kacmar, Fiorito & Carey, 2009) maintain that, in order to avoid rejection of new introduced IT systems, it is advisable to strategize by predicting user acceptance of an artifact before full implementation and usage. From the university point of view, Jan and Conteras (2011) state that there is a strong need to identify variables that influence technology acceptance and adoption. Within the same context, Rogers (1995) maintains that the innovation adoption level is not the same but it is useless to push all people to adopt it at the same time but rather start with innovators and early adopters as shown in the figure below:

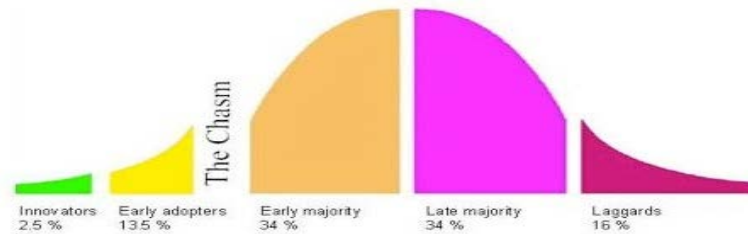


Figure 1. Innovation adoption lifecycle (Roger, 2005)

The research is emerging in the areas of adoption and usefulness of technology platforms in education sector (Park, 2009; Taher, 2012; Keller & Cernerud, 2002; Yuen, Fox, Sun & Deng, 2009), and on online thesis supervision in particular (Hallberg, Hansson, Moberg & Hewagamage, 2011; Hansson, Collin, Larsson & Wettergren, 2010). However, there is still lack of knowledge on behaviour intention and use of an online supervision system from teacher perspective in developing country from a new university setting.

The aim of this study is to determine behavioural intentions and usage of teachers and e-learning coordinators from University of Rwanda on SciPro System. To achieve this, participants' perceptions about this system are evaluated to identify the degree of importance of SciPro System resources and to assess the overall system usefulness in improving thesis supervision process at University of Rwanda.

Theoretical framework

Today, research in applied technology has noticed a fast growing rate of debates about innovation diffusion, system adoption, behavioural intention and user acceptance to use technology (Fishbein & Ajzen, 1975; Venkatesh et al., 2004; Davis, Bagozzi & Warshaw, 1989). An individual behaviour on adopting a technology depends normally on the level of expectancy toward using a particular artifact. Therefore, people may express different behaviours as they have different expectancies to an innovation. Thus, according to Roger (1995), an innovation in society may be simply an idea or an artifact made to improve a specific current process. The introduction of a new technology may result in adoption or rejection (Keller, 2005; Roger, 1995) and the user behaviour intervene in either of these tendencies. From this notion, in the education sector, students and teachers can have different expectations on a learning management system and at the same time the adoption and use of this system may be affected by other internal or external factors such as the social influence, the system's facilities and the organizational culture, structure and policies.

There are eventually a number of models, theories and frameworks that have been developed to assist researchers in predicting the user behaviour intention, the adoption and use of new systems and its usefulness. (Davis, 1993; Davis, Bagozzi & Warshaw, 1989; Roger, 1995; Venkantesh et al., 2004). Several researchers also used some of these models to evaluate the integration of e-learning systems (Keller, 2005; Chen, 2011; Xie, 2006; Straub, 2009; Gruzdl, Staves & Wilk, 2012; Park, 2009).

In educational technology research for example, the Unified Theory of Acceptance and Technology (UTAUT) record the highest and noteworthy level (70%) of accuracy in predicting user acceptance of technology as compared to previous related models (Moran, Hawkes & El Gayar, 2010; Wang, Wu & Wang, 2009; Park, 2009). This model is mainly composed of four independent variables retrieved from previous related models and theories: Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions (Venkatesh et al. 2004). This is considered as a new updated model as it also consider other four control variables of Gender, Age, Experience and Voluntariness. On top of these mentioned constructs, the UTAUT model is also made of behaviour intention and use behaviour as dependent variables.

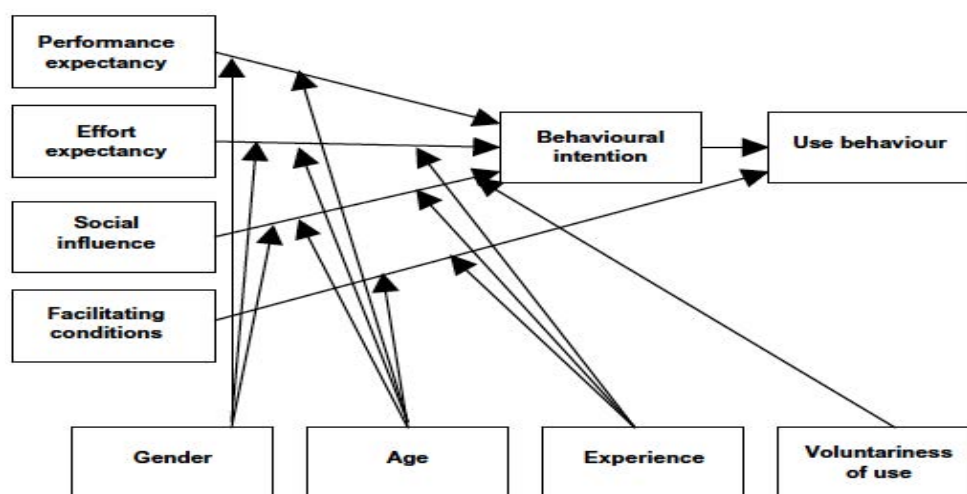


Figure 2. Unified theory of acceptance and use of technology model (Venkatesh et al., 2004)

The performance expectancy dimension is defined, as the extent to which someone believes that using a system will contribute to his/her job performance. This concept is considered as the convincing forecaster of the user's behaviour intention as compared with other constructs. The effort expectancy is defined as how effortless it is to use a system. This effortless is in deemed to be associated with the gender, age and experience of an individual. The third construct is the social influence, which is defined as a situation whereby the intention to use a technology by an individual is subjective to other important people around. The fourth independent construct is the facilitating conditions, which is defined as the extent to which a person believes that the organization and its technical infrastructure are there to support in using a particular artifact. The particularity of this construct is that it will not directly affect the behaviour intention in regard to a system but instead to the use behaviour.

Because SciPro is an online thesis supervision system, which is an Information System, its resources should reflect user expectations in order to be adopted and used effectively. If this is not the case, then it will be useless at university of Rwanda. Nonetheless, within the context of this study, UTAUT is used in the sense that the levels of perceptions from supervisors at University of Rwanda on SciPro system are used to determine the behavioural intentions and usage derived from related system features.

Overview of SciPro System

The scientific process system (SciPro) was first conceptually developed in 2006 at the Department of Computer and Systems Science, DSV, Stockholm University (Hansson & Momberg, 2011). Its implementation process started in 2010 at the same department and up to now, more features and modules are being incorporated with the main purpose of supporting thesis writing and supervision process for bachelor's, master's and PhD students. The general concept in SciPro system is about meta-coaching which encourage and support online self-learning through automated information technology platforms. The way SciPro system is built allows asynchronous and synchronous communication and access to online materials needed for different research undertakings.

According to Hansson, Momberg and Peiris (2012), the SciPro System is designed with a possibility to match different ideas from supervisors, students and the rest of the community via an Idea Bank. The later facilitate the matching of students' thesis topics with the current research activities at university and the industry and this is an opportunity to select those relevant research ideas that provide solutions to society needs. The Idea Bank can be described a research ideas management system that receives pools of ideas from students, supervisors, research funders, business society and governments and matches them to according to teachers' expertise and knowledge.

So far, with the continuous development of new modules of the system, SciPro has now been integrated with "Turnitin" an anti-plagiarism control system. This aspect of anti-plagiarism has prevented students to opt for copying other's work and encourages them to be creative and be creative in research. This is because they are now aware that SciPro System will not allow this scientific dishonest. With this new innovation, it is now easy for supervisors and students to examine plagiarized texts and this has improved the quality of theses published at DSV.

After getting information on the features and capabilities of SciPro system in supporting thesis production process, the University of Rwanda has been interested in implementing it in its six colleges in order to improve research activities in Rwandan public higher learning. It is in this framework, that a pilot study is conducted to evaluate future user perceptions and views of participants (teachers, system e-learning coordinators) and the senior management of the university on how they perceive this system.

Methodology

Data Collection

Participants in this research were selected via the centre of instructional technology (CIT) of the University of Rwanda and they were invited for the introduction and testing of SciPro System as a new technology in thesis supervision process. The research used an embedded case study with multiple units of analysis (Yin, 2003; Denscombe, 2010) by considering five of

the six colleges of the university. Afterwards, at each end of workshop session, questionnaires were distributed to participants to collect quantitative data.

Additional information about the adoption and use of SciPro System at University of Rwanda has been collected through unstructured face-to-face interviews and a researcher conveniently contacted respondents during and after the workshop. Interviewed participants discussed voluntarily and reflected about the new introduced system. Through these interviews, views and expectations on SciPro system were also collected and used for further analysis of the study results.

Data analysis

Regarding the type and environment of this study, a conceptual model of SciPro System adoption and use was developed to guide the researcher. The model is to be referred to when trying to investigate different variables and determinants of user perceptions on SciPro System resources, with reference to the UTAUT model. Afterwards, four independent variables of UTAUT model are used to accommodate all thirteen SciPro resources mentioned above: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI) and Facilitating Conditions (FC). Thereafter, this will predict the behaviour intention and use behaviour when the system will be fully implemented. The figure below shows the conceptual model for SciPro System resources in regard to main constructs of UTAUT Model.

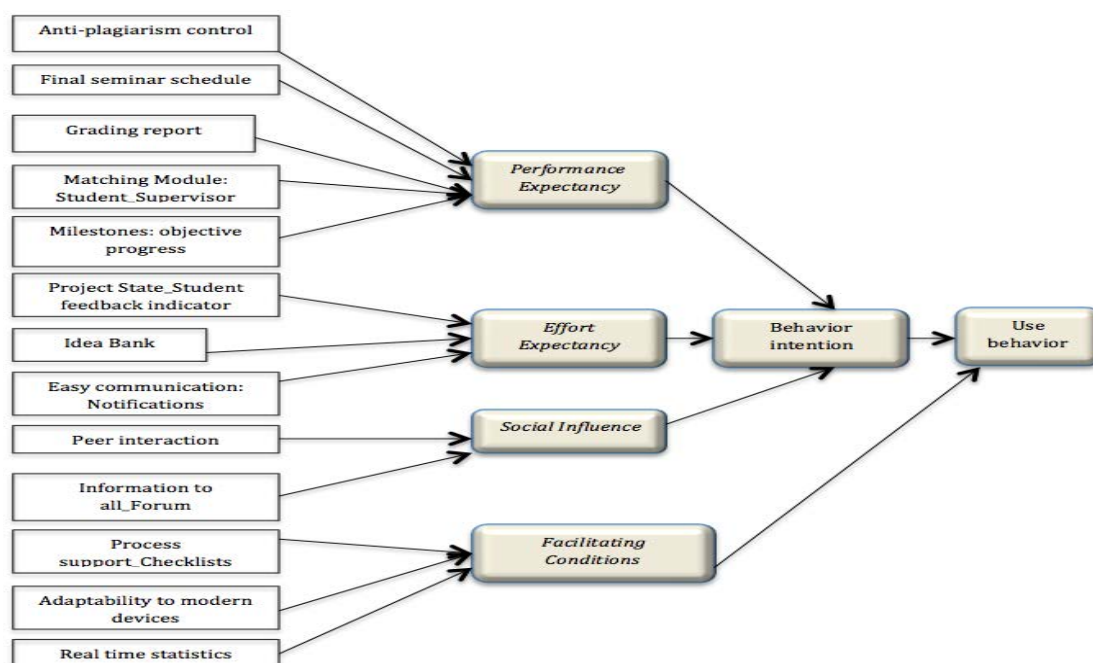


Figure 3. A conceptual model for SciPro system resources in UTAUT model

As per the figure above, the performance expectancy dimension includes five resources: Anti-plagiarism control, Final seminar schedule, Grading Report, Matching Module: Student_Supervisor and Milestones: Objective progress. The second dimension which is Effort expectancy includes Project state: Student feedback indicator, Idea bank and Easy

Communications: Notifications. The third dimension of UTAUT Model is Social Influence and it includes only Peer interaction and Thesis information to all. The last three resources of SciPro System that included in the fourth dimension of facilitating conditions are: Process support-checklists, Adaptability to modern devices and Real time statistics.

Hence, from this figure, the related mean from descriptive statistics were analyzed and reported to each dimension of UTAUT model in order to determine the overall intention behaviour and use of SciPro system at University of Rwanda from the user perception. Afterwards, the behaviour intention of supervisors was determined by calculating the average mean of the first three dimensions of the UTAUT model (PE, EE and SI). After that the use behaviour (UB) was obtained by considering the mean of behaviour intention (BI) and facilitating conditions (FC).

Results

This study was carried out at University of Rwanda from June to October 2014 during the starting point of SciPro test and implementation to improve the thesis supervision process. The population was composed of teachers (64.5%) and e-learning coordinators (35.5%) with the experience in academic institution ranging from 2 to 22 years. Both categories are involved in the supervision of both bachelor and master's research projects and they are from 5 of the 6 colleges of the recently created University of Rwanda.

In order to answer to the research question, mainly quantitative data were collected and analysed. In addition to that, qualitative information was also collected in order to back up quantitative information and enrich data interpretation. Hence, unstructured interviews have been conducted with five participants in SciPro test and each interview took on average 12 to 15 minutes. In general, the following data were collected, analysed and interpreted to get relevant answer to the research question.

Perceptions about the degree of importance to SciPro Resources

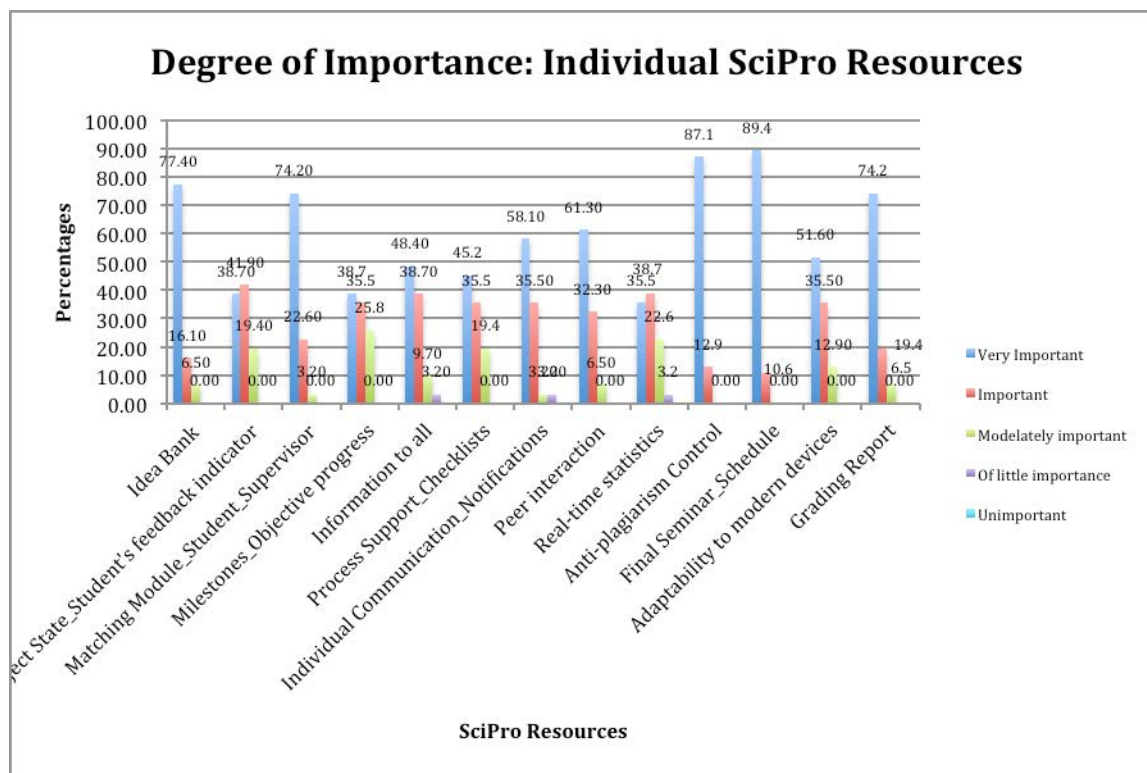


Figure 4. Degree of importance to SciPro System resources

From the table below, the study, first was interested to know the perceptions of participants on the importance of SciPro Resources. After that, these data were incorporated in four independent dimensions of UTAUT model, which is implied for this research. With these data, a researcher has proceeded on determining the mean of the degree of importance from each of the UTAUT dimension considered for this research. The table below shows these data in a detailed way:

Table 1: Grouping SciPro resources in regard to independent variables of UTAUT Model

UTAUT Dimensions	Very high	High	Moderate	Low	Very low
Mean Performance Expectancy	72,72	20,2	7,1	0	0
Anti-plagiarism control	87,1	12,9	0	0	0
Final seminar schedule	89,4	10,6	0	0	0
Grading report	74,2	19,4	6,5	0	0
Matching Module:Student_Supervisor	74,2	22,6	3,2	0	0
Milestones_objective progress	38,7	35,5	25,8	0	0
Mean Effort Expectancy	58,07	31,17	9,70	1,07	0,00
Project State_Student feedback indicator	38,7	41,9	19,4	0	0
Idea Bank	77,4	16,1	6,5	0	0
Easy communication: Notifications	58,1	35,5	3,2	3,2	0
Mean Social Influence	54,85	35,5	8,1	1,6	0
Peer interaction	61,3	32,3	6,5	0	0
Information to all Forum	48,4	38,7	9,7	3,2	0
Mean Facilitating Condition	48,4	35,5	16,15	0	0
Process support_Checklists	45,2	35,5	19,4	0	0
Adaptability to modern devices	51,6	35,5	12,9	0	0
Real time statistics	38,7	35,5	22,6	3,2	0

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By using the data from the table above a researcher has determined the mean for each of the UTAUT independents variables according to the teacher perceptions regarding SciPro Resources. The chart below provides clearly the details:

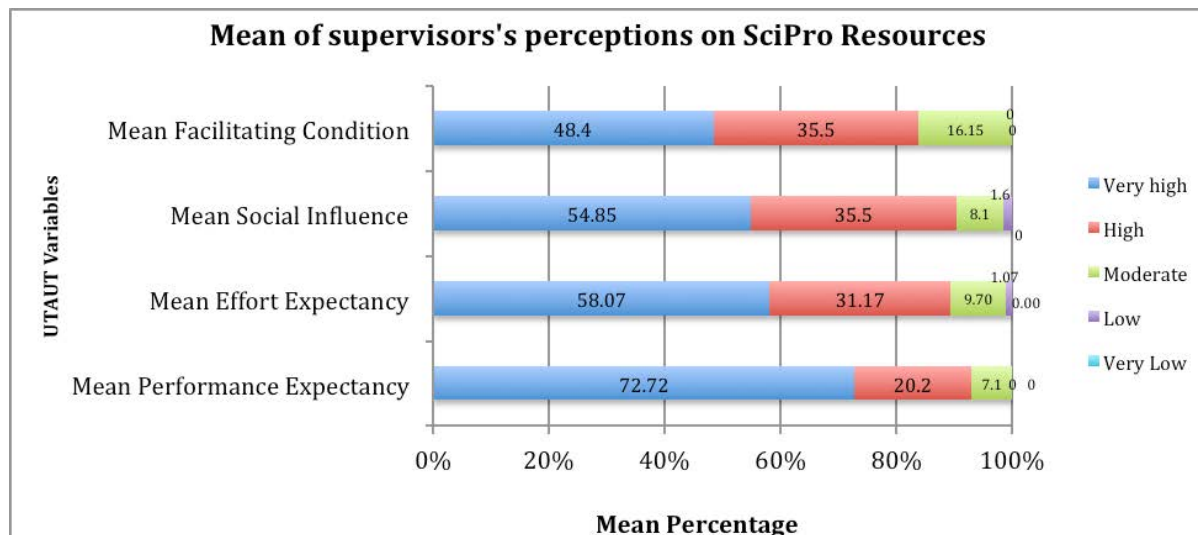


Figure 5. Perceptions about the degree of importance of SciPro Resources

As it can be observed from the table above, participants in the SciPro system test at University of Rwanda believe that the system will increase performance at the degree (92.74%) totalling the very high and high means. They also perceive the system as effortless to use with the degree of (89.24%). The social influence to using the SciPro System resources accounted for a high and very high degree of (90.35%) while the facilitating conditions are averaged to the level of high and very high (83.9%). All the UTAUT variables used to measure the supervisors' perceptions have recorded moderate views at 7.1%, 9.70%, 8.1% and 16.15% respectively.

But on the other side, this will depend on if other conditions outside the system are fulfilled. That is the reason why the information from this figure is not enough to confirm this assertion on the future use of this SciPro system at University of Rwanda. The reason is that some respondents posit that other external should be taken into consideration. Interviewed participants expressed some of the key factors such as ICT infrastructure in place, a clear E-learning Policy and motivation from the top management that should be considered to ensure success integration of SciPro System. One respondent, for example, has to explain the following:

".....what I am well aware about is that, even before the merging of our former universities, there have been other systems that failed not because they are not good, but you know.... Just because there is no clear e-learning Policy and ICT policy in place."

Discussion

The main purpose of this research was to evaluate user perceptions on the SciPro System which in the early stage of implementation at University of Rwanda. Expected users of this system include final year students writing on their research projects, teachers, e-learning coordinators and the management of the university. This research was interested only on teachers who are involved in supervision of students' research projects but also E-learning staff participated because they can play a crucial role in one way or another during system testing and implementation process.

By answering to the main research question, results reveal that participants in system test perceive that SciPro System intend to embrace and use the system for thesis supervision process at University of Rwanda. This has been proved by the reasonable percentages showing the degree of behavioural intention (90.78%) to usage calculated using data from supervisors regarding their perceptions in regard to SciPro resources. This can be more illustrated by the figures below:

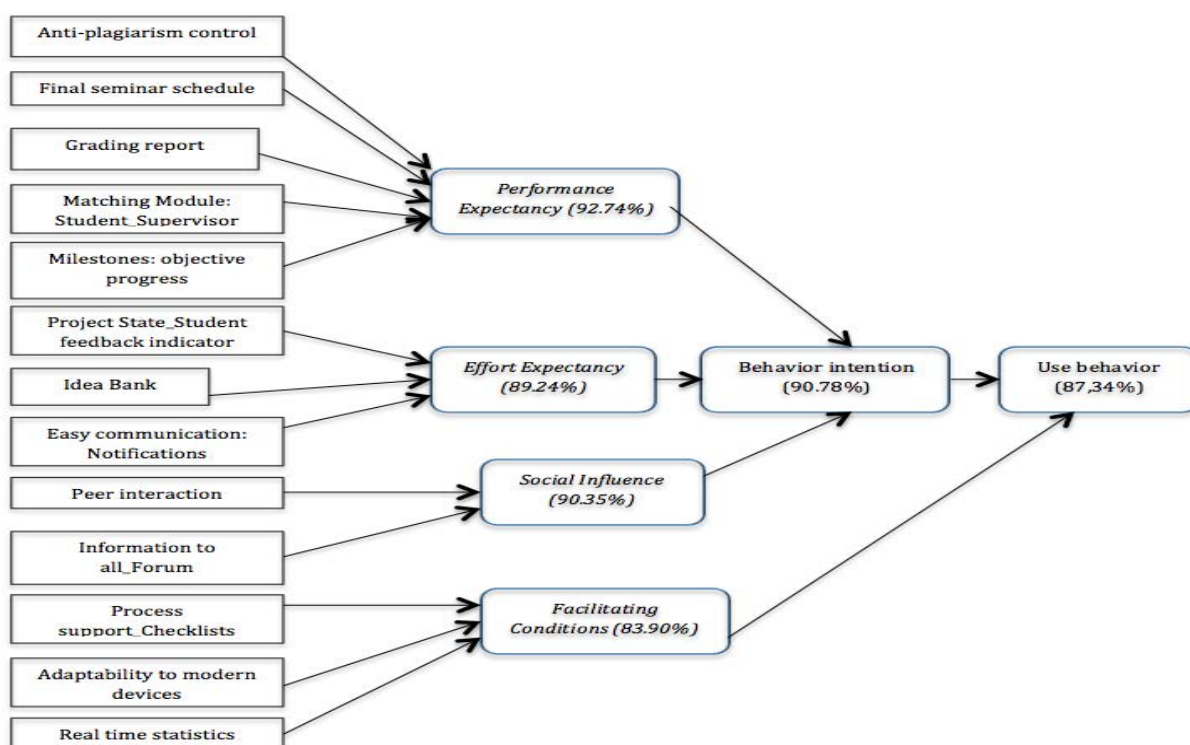


Figure 6. Supervisors' perceptions regarding SciPro System resources in UTAUT model

As it can be seen in the figure above, the degree of behaviour intention accounts for (90.78%), which is obtained from the mean of three dimensions of PE (92.74%), EE (89.24) and SI (90.35%). The degree of use behaviour is also estimated at (87.34%), which is the mean of BI (90.78%) and FC (83.90%).

On the other hand, information from interviews conducted during SciPro System Test reveals that to ensure successful implementation and usage of the SciPro system, there are other factors outside the SciPro resources that should be considered. Those are like the full management engagement and support, extrinsic motivation to those early adopters of the system and Internet accessibility for students and supervisors, system customization to fit in the university culture and practice.

Conclusion

This study explored supervisors' perceptions and determined the degree of behaviour intention and usage of the SciPro System at University of Rwanda. Results shows that the behaviour intention, which is high (90.78%) will have a direct impact to the usage behaviour (83.78%) if other facilitating conditions on SciPro itself (83.90%) and other external conditions discussed are fulfilled.

Furthermore, on top of developing a clear e-learning policy to support the implementation process, those people with high interest should be motivated by just recognizing their efforts in using such a new system to improve the quality of research at university. One interviewee (from the extract below) stated that recognition could be like to include this effort in their annual performance evaluation report and in their normal teaching workload.

"... I always get involved in E-learning systems adoption here, and to be honest I have been interested in this one because it is about research supervision. Students do plagiarize here and I want a system to check this, ... but how am I recognized by the leaders of this university? Is there any policy for motivating those who use it? I don't think there is ... and even those who don't use these new systems, no one asks them why! I think there is a need recognize this because sometimes these systems are expensive for our university and finally they are not productive. The same case happens for MIS."

With reference to the model of Rogers (1995) about the innovation adoption lifecycle, and on the fact that people are different in terms of technology adoption, a researcher recommends that the University of Rwanda should not consider all the trained teachers to adopt SciPro System. Conversely, from the test process, early adopters who showed a high interest in using the system should be followed up and be assisted as much as possible to use the system and later on others will come on board.

On SciPro System point of view, it has been advised to customize it to the university current thesis process especially some features such as peer review process and anti-plagiarism control functionalities.

One could also conclude that this study was just focusing on supervisor perception on the system. Therefore, further studies should extend this research on student perspective and the university management. In addition to that, there is a need also to research on other factors

outside SciPro system such as the university culture on adopting innovation, existing policies and regulations of the university, the existing basic ICT infrastructure and other UTAUT independent variables such as gender, age, experience and level of voluntariness from future users of this supervision system.

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