# AN EXPLORATORY STUDY OF STUDENT SATISFACTION: THE MODERATING ROLE OF DIGITAL TECHNOLOGIES

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**ABSTRACT**

*The main purpose of this study is to empirically examine how digital technologies facilitate student satisfaction in higher-education institutions. In this study, digital technologies in higher education are evaluated using students' perceptions about their satisfaction and performance. Significant correlations and relationships on the students' satisfaction over used digital technologies in teaching and learning processes have been examined. Based on the results of a cross-section survey with data drawn from undergraduates, we found that digital technologies have positive effects on student satisfaction. The results show that in forming student satisfaction, teaching, learning, and student expectation play a critical role. However, it was found that these relationships are moderated by the digital technologies. The theoretical and practical implications of these findings are discussed.*

**KEYWORDS:** *digital technology, higher education, student satisfaction.*

**JEL CLASSIFICATION:** *I25, I23, L86.*

## 1. INTRODUCTION

Nowadays, digital technology plays an important role in higher education. Faculty members and students have the opportunity to use the digital technologies that have the potential to be valuable resources in educational environmental as response to meet the world's rapidly changing needs emerged as the main focus of higher education. The expectations of students and the demands of the education community are changing radically in the last decade. In order to recruit and retain students, universities should aim to enhance student satisfaction and take measures to reduce student dissatisfaction.

Education is moving into the digital age. Digital technologies are increasingly used alongside traditional approaches to provide opportunities to teach and learn in ways that otherwise wouldn't be possible. These technologies are including electronic tools, devices and systems that generate, store, process and transmit data. Technologies play a potentially disruptive role because they are transforming the everyday life of academics and students and create new relations based on sharing, collaboration and creativity. Digital applications and networking tools are frequently referred to as Web 2.0 (Birdsall, 2007).

Digital technologies have received increasing attention from researchers and teachers in the field of higher education. However, empirical investigations how digital technologies can be used to facilitate teaching and learning processes and their impact on student satisfaction are rare. Thus,

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research on the moderating role of digital technologies on student satisfaction has so far been limited. For example, learning is not a simple matter of information transmission it is an active process in which students construct new understandings through active exploration, discussion, experimentation, analysis, and reflection. Digital technologies have the potential to transform how and what students learn through integration these technologies into teaching and learning.

This study investigates the extent to which the digital technologies helping to improve the student satisfaction. The investigation was undertaken via a questionnaire survey of academic staff and students from Politehnica University of Bucharest conducted in May 2015. We surveyed more than 60 undergraduates and found that digital technologies are a hard core of higher education.

The objectives of this research study are twofold. First, this paper aim to examine how digital technologies affect student satisfaction in technical university. In doing so, we propose a conceptual model consisting of teaching, advising, fellow students, career opportunities and student satisfaction. The last objective of this study examines the moderating role of digital technologies in the relationship between teaching, advising and student satisfaction.

The rest of the paper is organized the following way. The next section begins with a review of extant literature. Subsequently the research methods for testing the hypotheses are discussed. This is followed by the discussion of the findings, discussion of implications. The paper concludes with the limitations and future research directions.

## 2. THEORY AND HYPOTHESES

In this section, we explore the influence of the digital technologies on teaching and learning processes in higher education institutions. We next investigate the relationships between teaching, learning and student satisfaction. Finally, we examine the moderating role of digital technologies on student satisfaction by exploring students' perceptions of this impact during their academic studies. According to a review of the literature, numerous studies have examined the factors that influence academic success and student performance in higher education (Tonto, 2012; Jansen & Bruinsma, 2005). They influence not only how well students will learn but also how they will interact with teachers. In the case of engineer students there are a lot of digital tools used in specific industries. Traditional higher education learning environments are characterized by desks, black boards, and lecture halls. The organization of student learning has tended to follow traditional approach through face to face taught sessions. Nevertheless, the interactive digital technologies make possible learning environments which enable the development of the most sophisticated multimedia content. Mobile digital technology is a core part of information communication technology because these solutions have potential to create and sustain the learning process. The use of mobile digital technology as a teaching and learning environment in education enable academic staff to be innovative in integrating technology in their teaching and research activities (Massimo, 2014). For example, emerging technology like SmartLab may accomplish the future expectations of higher education.

However, study findings by Mahle (2011) suggest that the relationship between interactivity and student satisfaction may be dependent. Satisfaction occurs when perceived performance meets or exceeds the students' expectations and it is considered a short-term attitude about education service. Most higher education satisfaction studies focus on the delivery and operational aspects of the student educational experience. Student feedback can influence how a course is delivered and areas in which it might improve.

According to Hill et al. (2003), the factor that influenced students' perceptions is the teacher's quality and the quality of the student support. Most students believe that they receive high quality teaching from staff with high levels of expertise in their academic courses. We need to accept that teaching is no longer the poor brother of research. Universities must encourage good teaching and assessment. Based on the factors described above we hypothesize that:

**Hypothesis 1**: *Teaching quality directly influences student satisfaction*

**Hypothesis 2**: *Learning quality directly influences student satisfaction*

Majority of students are using mobile devices for educational games and collaboration with their peers. They also use video, social media, and cell phones for communications or e-readers for reading texts and articles. Universities also allocated resources to advising and counselling online their students. These actions tend to become most effective when advising and counselling is required for students and are linked to the other digital services as an integral part of the educational process (Tinto, 2012).

In order to respond to the dynamic environment, universities showed actively communicate to the education market. Greater competition existing today is to attract the best and brightest students. University has a great responsibility on the future generations. Hence, undergraduate students need to be equipped with the adequate skills, knowledge and abilities. Students will project the appropriate image of what they have learned. Universities are striving to build a distinct image in order to maintain their competitiveness in the market (Aroury et al., 2014). By the deeper knowledge of the students' expectations, the universities will gain a good image as a result of their satisfaction. Thus, the university image is the construct that most influences student satisfaction. Based on the above discussion, we hypothesize that:

**Hypothesis 3**: *Student expectations quality directly influences student satisfaction*

**Hypothesis 4**: *The overall image significantly and positively influences the students' satisfactions with the university*

Digital technologies offer the potential for different forms of teaching and learning. Tools such as social networking software, wikis, open-sources platform and open-access for open educational resources, enabling the creation, sharing, and using new knowledge are means by which teachers might empower their students to become knowledge co-creators rather than passive recipients. Students need skills to explore and synthesize data in order to identify knowledge and construct meanings (Aldhafeeri & Male, 2015). This study seeks to explore the range of possibility available to academic staff to enhance the teaching experience for students. Thus, digital technologies could allow universities to reinvent themselves (Selwyn, 2007). Students are now accustomed to accessing multiple open sources of information for solutions.

Learning is an active process in which people construct new understanding of the world through active exploration, experimentation, discussion, and reflection. We argue that in addition student learning potential will be enhanced by use of digital technologies and create an effective learning environment (Helfand, 2013). Students learn better when given opportunities to construct knowledge through the use of relevant digital technology (Keengwe et al. 2009). The availability of digital technologies is particularly relevant for teaching and learning in universities because increased accessibility allows students to access and use a set of digital resources and technologies in problem-solving, thinking, creating and designing. Thus, universities gained access to additional educational technology, including software, wireless networks and interactive whiteboards.

Digital media is a shift from static media to interactive platforms, which include virtual 3D environments, peer networking, social networks, and interactive games. Interactive digital are educational digital devices that provide interactive environments for students and teachers. Therefore, digital technologies are infused into the educational process to bridge the gap between theoretical and practical teaching and learning processes (Hernandez-Ramos, 2005).

The highest expectations are related to the learning goals of students. The students showed higher expectations for mobility, rich graphics, and interactivity want to access digital resources. This is indicative of a possible growing level of satisfaction of student (Palmer and Holt, 2008). The extent to which student expectations are fulfilled does appear to be a good predictor of satisfaction. In exploring the opportunities offered through the combination and integration of traditional teaching methods in higher education through use of appropriate digital technologies. Based on the above discussion, we hypothesize that:

**Hypothesis 5**a-d: *The effect of teaching, learning, student expectations, university image on student satisfaction significantly increase along with digital technologies*

The proposed model of conceptual framework for examining the moderating role of digital technologies among teaching, learning, advising, student expectation, faculty image, and student satisfaction is presented in Figure 1.
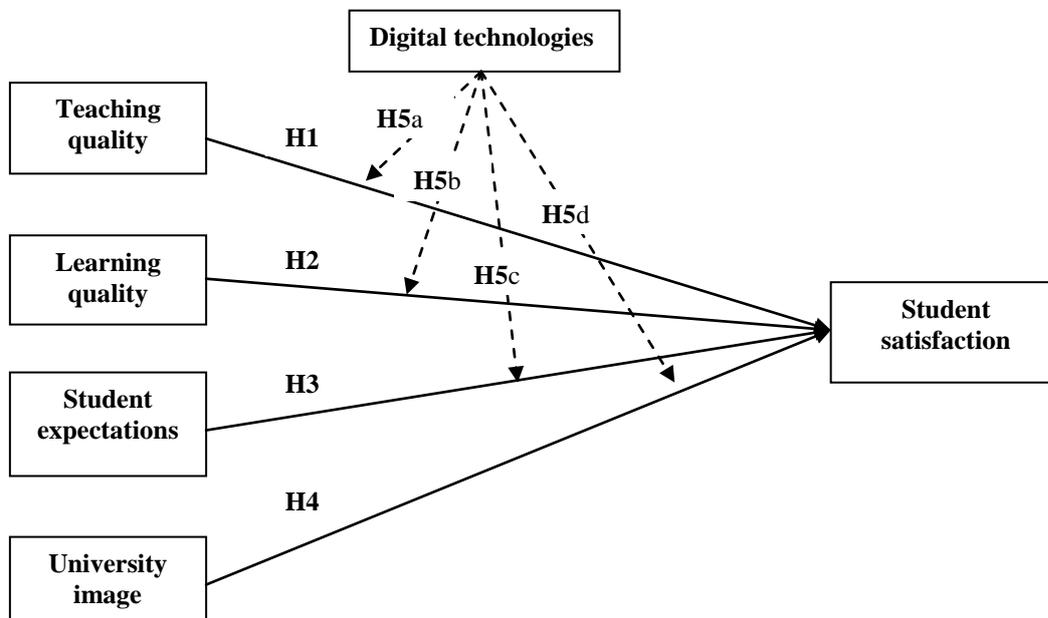


**Figure 1. The conceptual model**
*Source*: authors

## 3. METHODOLOGY

Although a growing number of papers are based on student survey of students' satisfaction in educational institutions, but a few of them capture students' perception about digital technologies. The scope of this study is limited to the technical universities. The focus of the research would be on students' satisfaction perception in their universities and the indirect effect of digital technologies. In this case, survey is the most appropriate research methodology for data collection and statistical analysis (Hair et al. 2006).

Data was collected through a survey with close-ended questions. All variables were measured using a 7-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree). Also, all constructs were measured using multi-item scales that was developed based on observations, theory, and previous studies, some items were adopted to ours research context. The statistical analysis methods employed for this study included descriptive statistical analysis and structural equation modeling (SEM) analysis.

The participants were 60 respondents. The number of female students (64%) was greater than the number of male students (Table 1). Most of the students were aged between 20 and 24 years. With respect to students' computer skills, almost all students (92%) rate their skill as average or higher.

**Table 1. The characteristics of sample**

| Variables | Description | Number | Percentage (%) |
|---|---|---|---|
| Gender | Female | 38 | 64 |
| | Male | 22 | 36 |
| Age | 18-20 | 14 | 23 |
| | 20-24 | 36 | 60 |
| | 24 or older | 10 | 17 |
| Computer knowledge level | Low | 5 | 8 |
| | Average | 46 | 77 |
| | High | 9 | 15 |

*Source*: authors

## 3.1. Operationalization of variables

Research constructs were operationalized using several scales adapted to our study. The survey aimed to assess students' perceptions of teaching, learning, student expectations, and faculty image with student satisfaction as the ultimate dependent variable. *Teaching quality* was measured using three items, namely students were asked about „their class or seminar teaching", „teacher's quality" and about „their courses as whole". *Learning quality* was measured using four-items, namely „curriculum", „learning resources / facilities", „student support /services", and „learning process and student experience". *Student expectations* was measured using two items, namely „content and structure of courses", „available of opportunities", and „digital technologies access". *University image* was measured using three items based on Chun (2005), namely „the students' perception of the university among his/her circle of friends and colleagues", „the students' perception of the university among general public", and „the students' perception of the university among employers". *Student satisfaction* was measured using two items, namely „the students' perception of satisfaction with the university in general" and „the students' perception of satisfaction with the university take into account their expectations". *Digital technologies* was measured using two items, namely „teachers have digital competencies and use them actively in education process", and „teachers create an efficient interaction with their students using digital technologies".

## 3.2. Survey questionnaire development

A pre-test was performed before the distribution of the formal questionnaires. A total of 15 pre-test questionnaires were distributed to obtain a pre-test sample. During this activity, explanations were also provided to clarify the questions. The questions, format, and scales of the questionnaire were examined and verified by these participants. The final instrument version was then developed according to the comments, assessments, and suggestions from these participants. Thus, the questionnaire was improved by rewording some items and removing the confusing items. Finally, well-established measures were used to reduce ambiguity and improve the validity of the measurement items.

## 3.3. Sample and data collection

The questionnaires were administrated to 60 students from Politehnica University of Bucharest. The investigation period ran from March, 2015 to April, 2015. The selection bias was controlled by determining sampling quotas on the basis of gender and age. A total of 54 questionnaires were retrieved, and 46 questionnaires (76.6%) were valid and were analysed. The total sample is composed of 52 percent women. A large percentage of the sample belongs the age between 21 and 23 years old. As regards their profiles as digital technologies users, 64 percent of the respondents use different types of educational software.

## 4. RESULTS AND FINDINGS

The measurement model was evaluated by studying global fit using several types of indices: $\chi^2$ and its statistical level of signification, the root mean square error of approximation (RMSEA), the comparative fit index (CFI). For a satisfactory model fit, the $\chi^2$ statistic must have a low value, because it means that there is no considerable difference between the matrix estimated using the model and the initial data matrix (Hair et al. 2006). The indicator CFI must exceed 0.9, and RMSEA must be below 0.05 (Hair et al. 2006). The Chi squared test has a limitation, it is very sensitive to sample size, so that the conceptual model can be rejected even if the fit is good (Bentler and Bonett, 1980). In our case, we can examine the ratio of $\chi^2$ to the degrees of freedom (df) for our model. A small value is indicative of good fit.

A scale has convergent validity when the items that compare a given scale converge on only one construct. The scale has discriminate validity when it measurements have no relationship with scale that measure different concepts (Hair et al. 2006). In our model, the results provided an overall good fit to the data (Hair et al. 2006): $\chi^2=483$, df = 38, RMSEA=0.048; CFI=0.883. All scales are valid because they are reliable and have convergent validity.

*Hypotheses testing*

We tested the proposed conceptual model using SEM (Structural Equation Modeling) with LISREL statistical software. This approach enables simultaneous evaluation of all the variables and the relationship among them. After studying model fit, the standardized β and its level of significant (t) were analysed. The standardized β represents the regression coefficients for the relations proposed in the model and take value between 0 and1. The relation is significant if the t value associated to the coefficient exceeds the critical values for the significant level 0.05 (critical value =1.96) and the significance value of 0.01 (critical value = 2.57) (Hair et al. 2006). The measurement model estimation is set out in Figure 2.
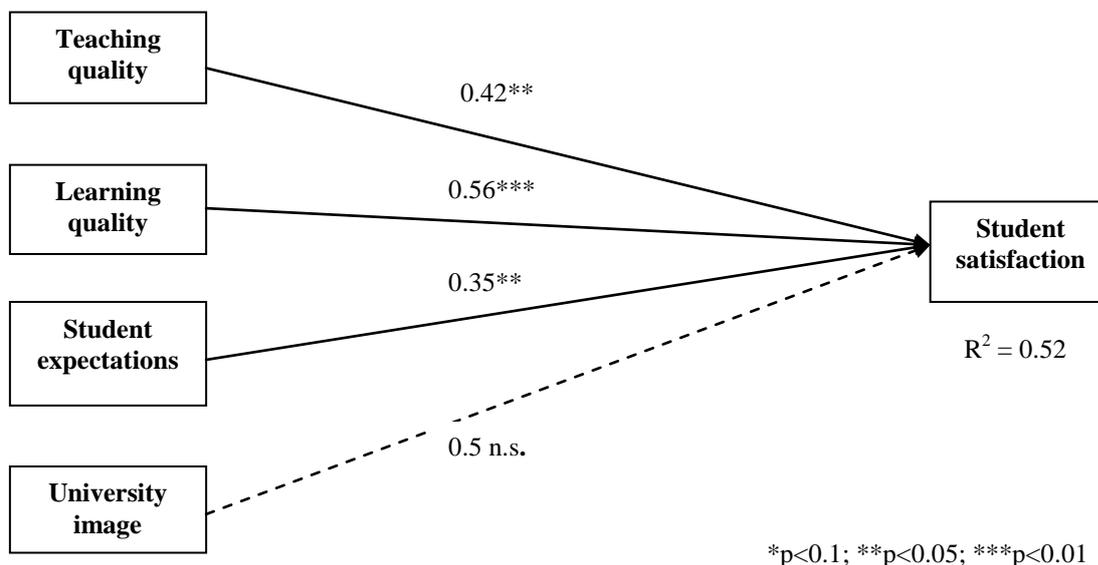


*p<0.1; **p<0.05; ***p<0.01

**Figure 2. Structural equation pathways**
*Source*: authors

Analysis of the path estimates reveals that all hypothesized paths are significant except the relationship between university image and student satisfaction. Thus, H4 was not supported. The teaching quality had a significant effect on the student satisfaction construct (β1 = 0.42; p<0.01), verifying H1. Further, the learning quality had a significant and positive effect on the satisfaction construct (β2 = 0.56; p<0.01), this provide support for hypothesis H2. Hypothesis H3 was supported

as student expectations had a positive and significant effect on student satisfaction ($\beta3 = 0.35$; $p<0.01$).

To test the moderating effects of digital technologies, this research adapted the hierarchical regression analysis. This analysis was carried out separately with each variable. Table 2 presents the interaction effects of digital technologies and student satisfaction. The results of the moderated hierarchical regression analysis show positive and significant interaction effect of digital technologies and student satisfaction ($\beta = 0.14$; $p<0.05$). This provides support for hypothesis $H5_a$; $H5_b$. The findings reveal that the effect of digital technologies on student satisfaction is greater for students' users which have digital skills above average. Results of the hierarchical regression analysis show that digital technologies has a positive and moderating effect on the learning quality ($\beta = 0.21$; $p<0.01$). This provides support for $H5_b$.

**Table 2. Hierarchical regression analysis results**

| Item | Dependent variable | |
|---|---|---|
| **Digital technologies:** | $\beta^a$ | p value |
| Digital technologies x Student satisfaction | 0.14 | <0.05 |
| Digital technologies x Learning quality | 0.21 | <0.01 |
| Digital technologies x Student expectations | 0.09 | n.s. |
| Digital technologies x University image | 0.02 | n.s. |

[a] *Standardized coefficient*

*Source*: authors

# 5. CONCLUSION AND FUTURE RESEARCH

The objective of this study was to investigate the relationships among teaching, learning, student expectations, university image, and student's satisfaction. The current study proposes that digital technologies would moderate these relationships. The results reveal that these constructs are all statistically significant with convergent and discriminant validity. The study finds support for the moderating role of digital technologies in the relationships among these variables. The findings suggest that digital technologies lead to greater education quality. Student adoption of digital technologies is influenced by the perceived usefulness tools and interactive tutorials.

A high level of education is a main raison to recommend a university. Higher education institutions should find ways of improving service quality through integrating digital technologies into teaching and learning processes. Thus, teachers provide innovative new learning experiences for their students. However, high level of student satisfaction does not necessarily lead to favourable university image.

Student satisfaction is positively influenced by student expectations. The extent to which student expectations are fulfilled does appear to be a good predictor of satisfaction. Higher education institutions must evaluate and monitor student expectations, as a way of improving student retention and increasing courses quality. University are required to respond to rapid changes such as emerging forms of digital technologies. Teachers play a critical role in deciding what kind of digital technologies should use in their teaching activities. The value of online content creation, interactions and real time feedback has more contribution to support the learning process. Teacher play role of coaches and students learn at their own pace.

One of the major limitations of this study didn't investigate other factors, such as student loyalty and faculty reputation. Future research can thus include these factors to better examine the relationship between student loyalty and student satisfaction and faculty reputation. The causal relationship among our proposed variables may be another limitation we suggest that future studies can gather data from various universities to further investigate the robustness of the research.

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