**Factors Affecting Actual Usage of Educational Technologies: The Mediating Role of Student Traits**

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**Abstract**

**Purpose:** Institutions worldwide face an era of rapid change, from technological transformation to creating a supportive university culture, which plays a major role in enhancing the educational setting. The current research study aims to assess the impact of TAM variables (perceived usefulness and perceived ease of use), along with university culture, on the actual utilization of information systems in educational settings. The authors propose using student traits as a full mediator between perceived usefulness, perceived ease of use, and university culture in influencing the utilization of information systems.

**Methodology:** The model was examined using the partial least squares (PLS) regression and bootstrapping method on a sample of 100 students from different faculties at Sidi Mohamed Ben Abdelah University.

**Results:** First, perceived usefulness, perceived ease of use, and organization culture significantly influence the actual utilization of information systems; at the same time, perceived usefulness, perceived ease of use, and university culture impact students' traits while using information systems. Additionally, findings confirmed that student traits mediate the impact of perceived usefulness, perceived ease of use, and university culture on the actual utilization of information systems.

**Originality:** Most related studies have examined the main predictors of the actual utilization of information systems, but they did not recommend the mediating elements that could clarify the indirect effect. This study fills a gap in explaining the variables shaping the utilization of information systems in educational settings by incorporating student traits as a full mediator. The authors also suggest including university culture as a predictor of actual utilization of information systems.

**Keywords:** Educational technologies, Perceived usefulness, Perceived ease of use University culture, Student traits

1. **Introduction**

The spread of educational technology has accelerated aggressively, especially following the outbreak of the COVID-19 pandemic (Andini & Arianto, 2023). Academic institutions from all over the world started to implement educational technology tools to adapt to new circumstances (Turnbull et al., 2021). The expansion of educational technology has granted students access to a wide range of online resources, allowed them to participate with the instructor via online classes, and allowed them to collaborate easily with peers (onaolapo & Oyewole, 2018). In addition to that, it also provides online assessment tools for the instructor, making it easy to evaluate students(Almaiah & Alyoussef, 2019). However, many institutions are still struggling to effectively utilize information systems, often due to the lack of proper user interactions with the system, which prevents them from getting the maximum benefits(Al-Rahmi et al., 2020). Digitalization is not only about using technology to make our work easier; to fully actualize the potential advantages of digital transformation, it is imperative that we cultivate an appropriate organizational culture. However, it is important to consider resistance to change among users when discussing cultural transformation. Many experts believe that open-mindedness towards new technologies leads to better results (Imran & Gregor, 2019). Transforming culture is a challenging task that requires considerable effort and research to fully understand the users. To achieve this, we measure the most significant variables, each comprising seven or six constructs, to obtain a better understanding of users. Therefore, this research aims to evaluate the factors that impact the actual usage of information systems, employing the technology acceptance model (TAM) along with university culture and using student characteristics as a full mediator, as presented in the conceptual model (figure 1).

1. **Literature review and research hypothesis**

**User Engagement**

**Figue1: Conceptual model of this study**

**Table 1 presents relevant studies that analyze the actual utilization of information systems with different predictors and mediators.**

|  |  |  |  |
| --- | --- | --- | --- |
| **Predictors** | **Mediator variable** | **Endogenous Construct** | Source |
| Performance expectancy | Behavior intention | Actual usage | (ALBLOOSHI & ABDUL HAMID, 2022) |
| Cognition | Emotion | Actual usage | (Yang, 2015) |
| Effort expectancy | Behavioral intention to use | Actual usage | (Moya et al., 2018) |
| Habit, facilitating condition, Hedonic motivation, Effort expectancy, social influence, Performance expectancy | Intention to enroll | Actual usage | (Lim et al., 2017) |
| Perceived usefulness, perceived ease of use, university culture | Student traits | Actual usage | This study |

* 1. **Theoretical Background** 
     1. Technology Acceptance Model (TAM)

The Technology Acceptance Model is widely used to understand and analyze how users adopt technology. Perceived usefulness and perceived ease of use are two constructs that play crucial roles in accepting or rejecting a new technology (Davis, 1987). Many researchers have used this model as a fundamental tool to understand user adoption by making further modifications and extensions (Tella & Olasina, 2014).

* + 1. Perceived usefulness

Perceived usefulness represents the degree to which a user achieves better results when using an information system, which means that users are competent enough to benefit from numerous advantages from the utilization of information systems (Davis, 1989).

Many scholars, such as. Abugabah et al., (2009;) Kositanurit et al., (2006;) Staples & Seddon, (2004;) Sumuer & Yildirim, (2015), mentioned the factors that can impact the actual usage of information systems. Moreover, all agreed that perceived usefulness is a significant variable that can affect the usage of information systems. In contrast, Gelderman (1998) it negated the impact of perceived usefulness on user performance. In addition, they affirmed that the impact of perceived usefulness on user performance is uncertain. However, he confirmed that his findings could not be generalized or universal. Therefore, the suggested hypothesis is presented as follows:

H1: Perceived usefulness has a positive relationship with actual usage.

* + 1. Perceived ease of use

Perceived ease of use was defined by (Davis, 1987) as the degree to which a user can use a particular system with minimal effort. Many scholars have agreed that perceived ease of use plays a significant role in IS adoption (Baki et al., 2018; Salimon et al., 2017, 2023). In educational settings, findings reveal that perceived ease of use enhances the interaction between students and professors, making their communication smoother and more effective (Tuma, 2021). Thus, the following hypothesis is presented as follows:

H2: Percived ease of use has a positive relationship with actual usage.

* + 1. University Culture

Universities possess complicated and multifaceted cultures, and any changes within these organizations are likely to be impacted by cultural factors. Recognizing cultural factors is very crucial for institutions to acquire a deeper understanding to navigate changes effectively (Sporn, 1996). University culture is a powerful variable that has an impact on shaping IS usage within academic institutions. Like any other organization, universities can implement modifications to upgrade their functionality; however, this could be challenging due to the cultural context of the institution. For example, change management can play a vital role in accepting new forms of change, including technological or systemic, functional, and even environmental changes. Hence, the less resistance to change, the smoother the process will be (Mcclafferty et al., 2002). In many studies, the role of culture is positioned to influence the direction and the power of relationships between the predictor and its influence on information systems (A Ali et al., 2016; Jackson, 2011; Kassim et al., 2012). Therefore, the following hypothesis is presented as follows:

H3: Actual utilization of information systems is influenced by a university culture

* + 1. Student Traits as a Mediator

User characteristics drive the optimal usage of information systems, as they can impact the user's ability to use the system efficiently (Robey, 1979). Scholars have become more aware of the relationship between user characteristics, including age, gender, language, values, tradition, and actual usage.(Sun, 2012). There is a study that was conducted to assess the relationship between user characteristics and performance. They concluded that user characteristics were among the most important variables influencing user performance (Abugabah et al., 2009). As stated by De Waal et al.( 2012), user characteristics can be differentiated based on five factors: sex, age, experience, educational skills, and technological skills. Freudenthal(2001) Measured the linkage between users' age and overall performance. The results showed that younger users had fewer problems than older users. The usability of information systems is highly correlated with most components of user characteristics, such as age, gender, education, and job title (Rangraz Jeddi et al., 2020). In addition, Myers et al. (2019) suggested that other external factors influence user characteristics, such as development experience, menu usage, and security. In addition, they concluded that user characteristics are highly correlated with user performance because they influence user reactions. Thus, the hypothesis is stated as follows;

H1a: Student traits mediate the relationship between perceived usefulness and actual usage.

H2 b: Student traits mediate the relationship between perceived ease of use and actual usage.

H3 c: Student traits mediate the relationship between university culture and actual usage.

**Table 2 lists these variables and their corresponding constructs.**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | Variable 1 | Items | Source | | Perceived Usefulness  (PU) | Ease of use | (Warkentin et al., 2007)  (Norzaidi et al., 2009)  (Isaac et al., 2018) | | Reliability | (Tan & Hsu, 2018)  (Singla, 2009) | | Accuracy | (Singla, 2009) | | convenience | (Naiwumbwe, 2012) | | Accessibility | (Naiwumbwe, 2012)  (Singla, 2009) | | Completeness | (Singla, 2009) | |
| |  |  |  | | --- | --- | --- | | Variable 2 | Items | Source | | Ease of use | Easy to use | (Tractinsky, 2018)  (Almajali et al., 2015)  (Sholikah & Sutirman, 2020)  (Aldosari, 2012) | | Clear | (Sholikah & Sutirman, 2020)  (Aldosari, 2012) | | Understanble | (Almajali et al., 2015)  (Sholikah & Sutirman, 2020)  (Aldosari, 2012) | | Do what I want to do | (Tractinsky, 2018)  (Almajali et al., 2015) | |
|  |
| |  |  |  | | --- | --- | --- | | Variable 3 | Items | Source | | Organization culture | Risk tolerance | (Riyanto & Panggabean, 2020) | | Commitment | (Karyotakis & Moustakis, 2016) | | Engagement | (Ouma, 2017) | | Consistency | (Mustafa et al., 2016) | | Collaboration | (Ouma, 2017) | | change management | (Zimmerman et al., 2016) | | Trust | (Alizadeh & Panahi, 2013) | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | Variable 4 | Items | Source | | Students traits  (ST) | Experience | (Singla, 2009)  (Abugabah et al., 2009)  (De Waal et al., 2012) | | Motivation | (Maguire, 1998) (Leitner et al., 2010) | | Curiosity | (Kim, 2014) | | User knowledge procedural | (Cormier et al., 2013) | | Confidence | (Kim, 2014) | | Learnability | (Huang et al., 2010) | | Flexibility | (Cormier et al., 2013) | |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| |  |  |  | | --- | --- | --- | | Variable 5 | Items | Source | | Actual usage  (AU) | Frequency of use | (Isaac et al., 2018)  (Zimmerman et al., 2016) | | Performance improvement | (Riandi et al., 2021) | | Communication | (Sewandono et al., 2023) | | Store and share documents | (Sewandono et al., 2023) | | Effective | (Abugabah et al., 2009)  (Hou, 2012)  (Riandi et al., 2021) | | Efficient | (Abugabah et al., 2009) | | Creativity | (Suki & Suki, 2017) | |

1. **Research Methodology and Findings**

**2.3.1 Construct reliability and validity**

Construct reliability and validity were used to determine the accuracy of the constructs used in the study(Cunningham et al., 2001). Cronbach’s alpha, composite reliability, and Average Variance Extraction were all measures used to determine internal consistency reliability. Most studies agree that item loading should be equal to 0.5 or higher (Anderson et al. 2006; Lu et al. 2007; Selim 2003). As presented in Table 3, Cronbach’s alpha, composite reliability, and Average Variance Extraction were all greater than 0.6. Thus, these findings indicate that all criteria were established.

**Table 3: Construct validity testing**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Cronbach's alpha** | **Composite reliability (rho\_a)** | **Composite reliability (rho\_b)** | **Average variance extracted** |
| **AU** | 0.927 | 0.930 | 0.941 | 0.695 |
| **EU** | 0.891 | 0.897 | 0.925 | 0.695 |
| **PU** | 0.866 | 0.879 | 0.900 | 0.602 |
| **UC** | 0.919 | 0.923 | 0.935 | 0.673 |
| **UNC** | 0.923 | 0.929 | 0.940 | 0.725 |
|  |  |  |  |  |

**Table 4: HTMT-Matrix**

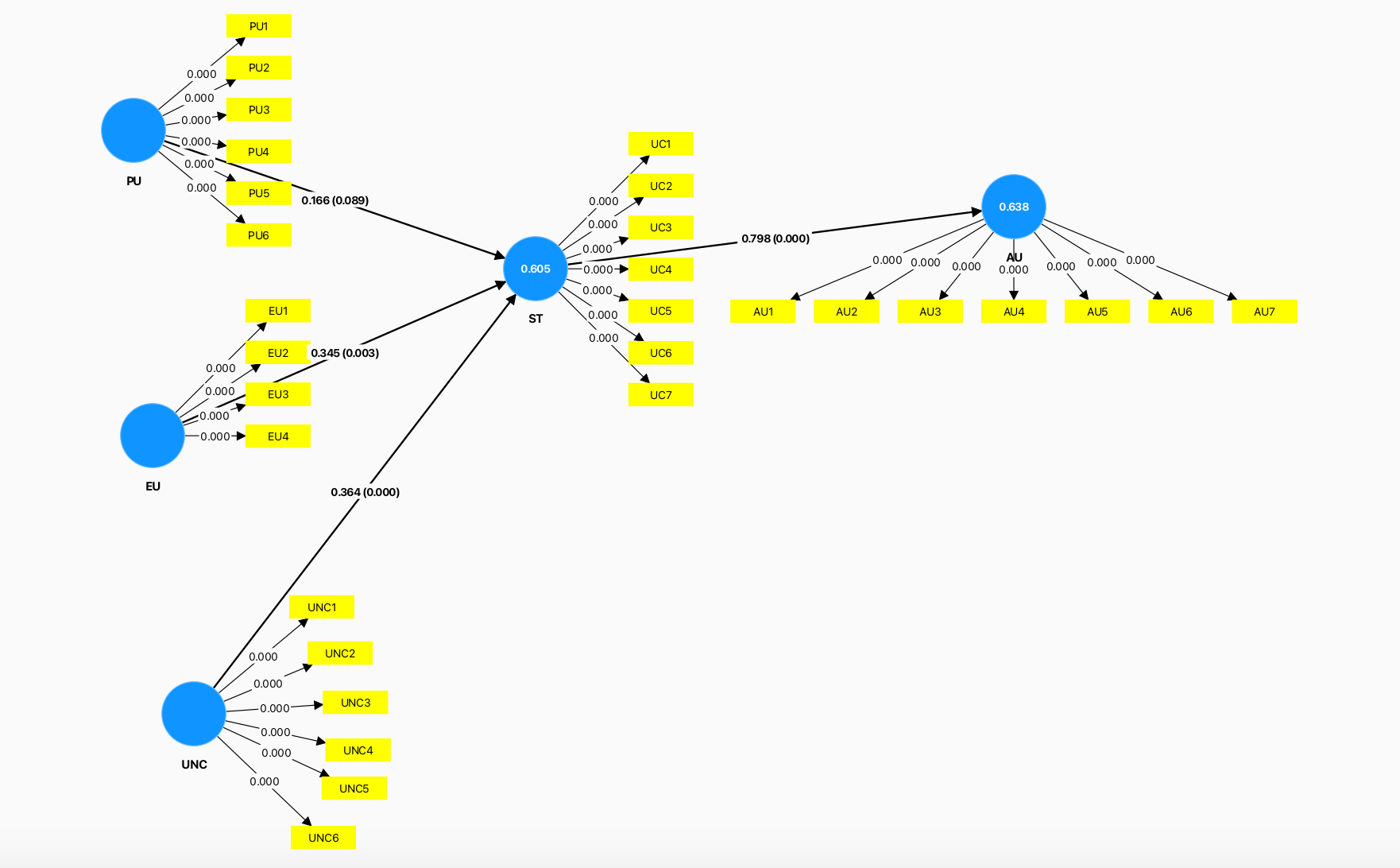
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **AU** | **EU** | **PU** | **ST** | **UNC** |
| **AU** |  |  |  |  |  |
| **EU** | 0.751 |  |  |  |  |
| **PU** | 0.689 | 0.740 |  |  |  |
| **UC** | 0.858 | 0.783 | 0.667 |  |  |
| **UNC** | 0.887 | 0.789 | 0.668 | 0.766 |  |

**2.3.2 Discriminant validity**

After confirming the accuracy of the convergence validity, the next step was to validate the discriminant validity. This research uses the HTMT matrix. The HTMT matrix was used to measure discriminant validity by determining whether the correlations between items measuring the same construct are higher or lower than those between items with different constructs. Table 4 shows that most HTMT values are approximately 0.6 and 0.7, lower than 0.9 (Rasoolimanesh, 2022). Therefore, we concluded that discriminant validity was established.

**Structural model**

In this study, partial least squares regression was used to examine the factors that can impact the actual usage of information systems. As Hair et al.(2014) suggested, this method uses a bootstrapping approach with a sample size of 5000 to obtain adjusted R2 and t-values. The findings of this study showed that perceived ease of use, perceived usefulness, and university culture affect the actual usage of information systems. As presented in Table 5. For the total effect, students’ traits have a greater impact on the actual utilization of information systems in educational settings (β=0.798p value=0.00). The second value that has an impact on actual usage is university culture (β=0. 0.291 p<0.05). Similarly, perceived usefulness and ease of use had an impact on the actual usage of information systems (β=0. 0. 0.133p<0.10) and ( β=0. 0.275, p<0.05), respectively. Thus, H1, H2, and H3 were supported. Moving to the role of mediation, results show that students’ traits are influenced by perceived ease of use, perceived usefulness, and university culture. Additionally, student traits mediate the relationship between perceived usefulness and actual usage, perceived ease of use and actual usage, and university and actual usage. Hence, H1a, H2b, and H3c were supported with an R-square that is equal to 0.636.

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**Figure 2 Graphical output of the study**

**Table 5 shows the total effects, Mean, STDEV, Tvalues, p values**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Original sample** | **Sample mean** | **Standard deviation** | **T statistics** | **P values** |
| **EU-AU** | 0.275 | 0.268 | 0.094 | 2.925 | 0.003\*\*\* |
| EU-ST | 0.345 | 0.335 | 0.116 | 2.973 | 0.003\*\*\* |
| PU-AU | 0.133 | 0.148 | 0.078 | 1.707 | 0.088\*\* |
| PU-ST | 0.166 | 0.186 | 0.098 | 1.698 | 0.089\*\* |
| **ST-AU** | 0.798 | 0.799 | 0.039 | 20.621 | 0.000\*\*\* |
| **UNC-AU** | 0.291 | 0.285 | 0.084 | 3.462 | 0.001\*\*\* |
| UNC-ST | 0.364 | 0.355 | 0.099 | 3.688 | 0.000\*\*\* |

\*\*\* significant at 5 percent

\*\* significant at 10 percent

**Table 6 presents Specific indirect effects**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Original sample** | **Sample mean** | **Standard deviation** | **T statistics** | **P values** |
| UNC-ST-AU | 0.291 | 0.285 | 0.084 | 3.462 | 0.001\*\*\* |
| EU-ST-AU | 0.275 | 0.268 | 0.094 | 2.925 | 0.003\*\*\* |
| PU-ST-AU | 0.133 | 0.148 | 0.078 | 1.707 | 0.088\*\* |

1. **Discussion**

The main goal of this research is to shed light on the user impact that can have a major consequence on a system’s success or failure. Many studies have investigated the factors that influence the actual utilization of information systems, but they have not focused on a user-centered approach. Educational technology in Morocco is starting to gain more interest, especially after the pandemic of COVID-19. Accordingly, investigating the variables influencing the actual utilization of the information system is key to the strength of the quality of the education system in Morocco. Indeed, adding university culture as a predictor of the actual utilization of information through student traits enriches the understanding of how university culture and student characteristics interplay in gaining the maximum benefits from using educational technology. The findings of this research showed that a supportive academic environment can play a major role in using technology effectively. Similar to our findings, (Qatawneh, 2023) we found that organizational culture is a main predictor of achieving good utilization of information systems. In line with previous (Baki et al., 2018; Liesa-Orús et al., 2023; Shen et al., 2006), our results suggest that perceived usefulness and perceived ease of use influence the actual utilization of information systems in educational settings.

1. **Conclusion**

The proliferation of new technologies has increased significantly in recent years. Many industries, including education, operated differently during the information system revolution. The measurement of the usage of information systems has been presented in many studies. Based on past research, the usage of information systems is mainly influenced by variables presented in the TAM and UTAUT. However, all mentioned scholars agreed that perceived usefulness, Ease of use, organization culture, and User characteristics strongly influence the optimal usage of information systems.

The efficiency of the information system goes beyond creating and analyzing things correctly; but saves time and generates the right thing. The more control one has over the input, the more control one will have over the output. According to Subiyakto and Ahlan (2014), the most difficult element to control input is people. That's why analyzing the factors that can control “people” or “user performance” is important. Minimizing the uncertainty of user reaction towards new technologies could solve many problems.  In Morocco, many organizations started to invest heavily in new technologies. However, most of them don't generate the accrued and required performance, and this is due to the user. Thus, the goal of this research is to bring the maximum benefits and enhance the performance of Moroccan universities by making them more effective and efficient. The diversity in technology starts spreading around all organizations due to economic, social, and legal forces. Achieving good performance is linked to having a well-integrated technology system. As a result, all organizations should start to invest in new information systems to enhance their efficiency.

1. **Study Limitations**

In this study, the Technology Acceptance Model (TAM) theory was used to discover the factors that impact the actual usage of information systems in educational institutions. One of the limitations of this study is that other theories can have an impact on the actual usage of information systems, especially the modified version of UTAUT 2, meaning that further variables can be used to assess the usage of information systems accurately. Most studies conducted in this field do not necessarily involve a Moroccan sample, which could potentially impact the generalizability of the results. Despite the time constraints, this study has limitations in exploring future research avenues. However, other variables can be added to gain a better understanding of the factors that influence the usage of information systems in Moroccan universities.

In summary, while this study provides useful insights into the usage of information systems, future research could explore other potential factors that impact the usage of information systems in this context.

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