

## Applying artificial intelligence in predicting educational excellence in higher education institutions: A case study in Jordanian universities

Mohamed Hadi Al Najdawi<sup>1\*</sup>, Fanar Shwedeh<sup>2</sup>, Mahmoud Mokhtar Abdelmoghies<sup>3</sup>, Abdelkarim Kitana<sup>4</sup>, Ahmed Ali<sup>5</sup>

<sup>1,5</sup>Collage of Humanities, City University Ajman, Ajman, UAE; m.najdawi@cu.ac.ae (M.H.A.N.).

<sup>2,4</sup>Collage of Business, City University Ajman, Ajman, UAE.

<sup>3</sup>Collage of Law, City University Ajman, Ajman, UAE.

**Abstract:** Monitoring the responsible application of Artificial Intelligence (AI) in higher education requires the establishment of robust regulatory frameworks and thorough policy guidelines. The study concentrates on important elements that could impede the excellence of education, including issues with data security, privacy, and policies as well as legal frameworks. By examining these variables, the study aims to address the particular opportunities and difficulties encountered in this setting and to gain a deeper knowledge of how AI deployment affects educational excellence in Jordanian higher education institutions. A survey research methodology has been chosen. Institutions in Jordan that have started implementing AI or metaverse technology were given a pre-made questionnaire. The population of students in Jordanian higher education institutions, including both local and foreign students at different educational levels, is the main subject of this study. During the three-month data collection phase, the sample size was cautiously raised to more than 457 individuals in order to boost the research's robustness. The results show that the AI adoption, trust in technology (by data privacy and security), and policy & regulations in Jordanian higher institutions have significant impacts on educational excellence. Our results highlight the urgent need for policymakers to reevaluate and explain current regulatory frameworks in order to safeguard educational excellence, while also confirming the transformative possible of AI implementation in improving instructive resources and services. This study demonstrates the possible benefits of integrating AI technologies into educational backgrounds by confirming the strong correlation between AI adoption and educational excellence. In order to increase the effectiveness, usability, and caliber of educational resources and services, schools ought to think about implementing AI-driven tools and platforms.

**Keywords:** *Artificial intelligence, Data governance, Educational excellence, Higher education institutions.*

### 1. Background

In Jordan, where education and excellence are highly valued, adopting artificial intelligence (AI) and giving priority to educational excellence are crucial [1–7]. Given this, the Jordanian government acknowledges the revolutionary potential of AI technologies in higher education [7, 8]. As a result, the Jordanian government is striving to lead the world in AI innovation and adoption [139]. Significant expenditures have been made in AI research and development to help achieve this goal, which is consistent with the larger goal of expanding AI applications in a variety of fields, such as education and smart city safety [9–12]. In order to smoothly integrate AI technology into the Jordanian universities' educational system, the government has put policies and plans into place [13–16]. The country's strong commitment toward excellence is mirrored in its plan and its national agenda, which places a strong emphasis on energy efficiency and environmental preservation [140]. Raising academic standards, improving student performance, enhancing operational efficiency, and promoting sustainable practices are the objectives of higher education in Jordan [141]. In this regard, incorporating AI technology into

institutions of higher learning presents a viable way to accomplish these many goals [17–21]. Universities [22–26] and colleges in Jordan can improve academic results, encourage energy conservation on campuses, improve resource management, and offer students individualized help by utilizing AI capabilities [1], [2], [3].

This is especially crucial in Jordan, where the country's strong commitment to sustainable development makes AI a key component in autonomously controlling energy use on college campuses [6, 8, 27–34]. These programs complement the country's plan to lower carbon emissions and encourage sustainability in a number of areas, including higher education [4], [5], [6]. These sustainability aims might be greatly aided by AI-powered energy management systems [35], which could improve campus energy efficiency and conservation through automated energy-saving measures, real-time data analysis, and inefficiency detection [13, 35–37].

To achieve educational excellence, experts note that integrating AI in higher education institutions presents a number of difficulties [14, 38]. Addressing trust-related issues, especially those pertaining to data security and privacy, is one of the biggest challenges [39, 40]. Large amounts of student data must be accessed in order to adopt AI technologies [41–45], which raises valid concerns about data security [142] and the protection of students' right to privacy, particularly in the multicultural setting of Jordanian higher education [46, 47]. The adoption and implementation of AI technologies in various educational contexts may also be impacted by the distinct challenges and differing stakeholder expectations brought about by the diverse cultural milieu. This emphasizes how careful modification is required to satisfy certain cultural demands and expectations [48, 49].

Furthermore, monitoring the responsible application of AI in higher education requires the establishment of robust regulatory frameworks and thorough policy guidelines [50–52]. Establishing stakeholder trust via transparency, fairness, and responsibility across neural networks and processes for making decisions mitigates potential dangers and biases. [53–57]. This in turn supports the necessary advancement for educational advancement by encouraging the ongoing deployment of AI in academic settings [58,59]. There is still a significant study deficit, particularly across the setting of higher education in Jordan, even if recent studies offer insightful information about the adoption of AI and educational excellence in many contexts and industries (Aburayya et al., 2020; Al-Najdawi, M. H. Y., 2022a, 2022b). The special potential and difficulties that come with using AI technologies to attain educational excellence in Jordanian higher education institutions have not been thoroughly studied [60,61].

Therefore, by carefully examining the problem, our study seeks to close that gap. The study will concentrate on important elements that could impede the excellence of education, including issues with data security, privacy, and policies as well as legal frameworks [143-149]. By examining these variables, the study aims to address the particular opportunities and difficulties encountered in this setting and to gain a deeper knowledge of how AI deployment affects educational excellence in Jordanian higher education institutions [7], [8], [9].

## 2. Literature Review

### 2.1. Educational Excellence

An essential concept in higher education is educational excellence, encompassing the promotion of outstanding academic achievement, pupil achievement, and effectiveness in operations, whereas ensuring the foreseeable economic, public, and environmental capability of educational institutions. [62-69]. Therefore, achieving educational excellence necessitates an all-encompassing strategy that takes into account the various elements influencing the educational ecosystem [70–72]. The amalgamation of AI via a focus on security and privacy of data issues, rules and legislation, concerns about ethics, algorithmic bias, pupil cooperation, and educators' capacity to deliver precise prompts to technology for learning are among the critical factors identified by research on educational excellence that influence its success [69, 70, 73]. This research explicitly looks at the relationship between trust and higher educational excellence, taking into account ethical considerations, bias in AI algorithms, data rules and

regulatory frameworks, and data privacy and security concerns. The study uses the socio-technical system theory as its intellectual underpinning to address this [10], [11], [12].

A thorough foundation aimed at understanding the complicated relationships between ethical issues, regulatory frameworks, and data privacy problems in educational institutions is provided by the Socio-Technical Systems Theory (STSS) [74, 75]. Institutions can create strong data policies that incorporate ethical standards and guarantee regulatory compliance by recognizing the interconnectedness of the technological and social aspects [74,76]. Based on previous research, this tactic protects privacy and enhances responsibility, it also makes sure that technology is used in a way that is consistent with larger social ideals, which supports educational excellence [46, 47]. This study examines the practical application of the Socio-Technical Systems Theory in order to build better strategies that strike a balance between information technology, morals, and rules and ultimately establish a healthier data ecology within the context of education [13], [14], [15].

According to earlier research, the STSS Theory can be used to study how ethical issues, information confidentiality issues, and governing outlines interact in educational institutions [77, 78]. According to the notion, systems are intricate integrations of social and technological components that impact and mold one another rather than being just technical entities [79]. This viewpoint makes it possible to comprehend how human elements and technology interact to produce a morally acceptable and sustainable educational infrastructure in a more nuanced way [16].

The STSS Theory emphasizes how crucial it is to take a comprehensive approach to comprehending how data regulations, legal frameworks, and the human element interact in instructive contexts [80]. It acknowledges that data privacy is a complicated socio-technical problem rather than just a technical one, and that organizations must adopt data rules that strike a balance between ethical considerations and technological advancements [81]. The approach emphasizes that robust ethical standards that preserve individual privacy rights should be incorporated into effective data regulations in addition to technical safeguards [82]. In order to ensure that data use is in line with larger social values and norms, ethical concerns are consequently essential in directing the design and implementation of data systems [83].

The STSS Theory clarifies the complex nature of compliance within the setting of regulatory systems [17]. The human factor is just as crucial in guaranteeing adherence to these standards as technical safeguards for data protection [46]. According to the notion, developing a principle of obedience requires striking a careful equilibrium among increasing human awareness and implementing technology protections [83,84]. As a result, organizations which implement this viewpoint acknowledge that governing outlines ought to be regarded as integrated socio-technical methods rather than as discrete technical solutions [85,86]. These institutions are also needed to proactively create regulations that take into consideration human behaviors that might either strengthen or weaken compliance efforts as well as the intricacies of technology, as suggested by [84,87].

## 2.2. AI Implementation in Higher Education

Scholars are paying more and more attention to the deployment of AI, especially in higher education institutions [149-155]. For example, according to Wang's [88] research, higher education leaders' use of AI improves efficiency and supports data-driven decision-making, but it may also result in disagreements over decision-making [89]. Researchers are looking at how AI is affecting different aspects of the educational landscape as its inclusion in higher education keeps growing. A review of current research shows both encouraging and conflicting results [90]. Significant promise has been demonstrated by AI technology to improve students' individualized learning experiences [90]. Institutions can adjust instructional content and tempo to maximize student comprehension and engagement by analyzing individual learning patterns using AI-powered analytics [61,91].

Research showing improved academic achievement and increased student satisfaction supports this enhancement in the learning process [155-160]. Furthermore, Chatbots and automated assistants driven by AI have demonstrated potential in offering prompt support, responding to enquiries, and expediting administrative tasks—all of which improve the overall student experience [91,92].

Notwithstanding these developments, some research has revealed negligible impacts on scholar results, emphasizing the necessity of cautious application and continuing evaluation [93].

Furthermore, prior empirical research on the application of AI-driven predictive analytics to student retention rates has produced conflicting results [94]. On the one hand, studies have demonstrated notable advancements in the identification of students who are at risk, allowing for prompt interventions to lower dropout rates [85, 95]. Institutions can proactively identify problematic students and offer specialized interventions to improve persistence by examining historical data and finding trends [96,97]. However, several studies highlight these models' shortcomings, especially when it comes to taking socioeconomic and cultural aspects that affect student attrition into account [98]. Notwithstanding these obstacles, there is still room for more research because the promise of AI to improve student achievement is still a major topic of interest [99].

Although the outcomes have been inconsistent, the usage of AI-generated content has garnered a portion of courtesy in the context of instructional design [100]. Some studies emphasize the efficiency improvements made possible through systematizing the preparation of instructional resources and valuations [161-165]. AI-generated content gives teachers access to individualized learning tools while allowing them to concentrate on more advanced teaching techniques [100]. The quality of AI-generated information has been questioned, nevertheless, as some studies have found inconsistent and contextually irrelevant content [58, 101]. Therefore, finding a balance between boosting productivity and maintaining educational quality remains challenging as institutions continue to research AI applications in education [18], [19].

### *2.3. Regulations, Data Governance and Trust*

Regulatory frameworks and data regulations are now crucial tools for influencing data management procedures, especially in the educational field. Several studies demonstrate how crucial these frameworks are for safeguarding private data and encouraging ethical data practices in educational institutions [50]. Policies that are thorough and well-defined guarantee that data management conforms with legal and ethical requirements [165-170]. For instance, strong frameworks protect individual privacy rights by facilitating the safe gathering, storing, and sharing of student data [102]. Institutions can support educational excellence and improve the entire student experience by setting clear principles that encourage trust and accountability in their data management procedures [20], [21], [22].

Additionally, established policies encourage accountability and openness, which strengthen data-driven decision-making processes and stakeholder trust. Notably, streamlined processes, increased institutional efficiency, and successful adherence to new data protection laws have all been associated with the successful adoption of data policies [103, 104]. Although the importance of regulatory frameworks and data policies is well acknowledged, the literature also identifies situations in which its influence might be less noticeable [105]. Strong frameworks don't always guarantee constant adherence throughout the organization [106].

Problems frequently occur during the implementation stage, when things like ignorance, a lack of funding, or inadequate training might make it difficult to carry out these policies effectively [105]. Furthermore, frameworks may be vulnerable to flaws or inconsistencies due to the intrinsic complexity of data management systems and the quickly changing regulatory environment around data [107]. Accordingly, the efficacy of data rules might not necessarily result in noticeable results right away [108]. To close these gaps and improve the general efficacy of data management procedures, a multipronged strategy involving awareness campaigns, training, and frequent evaluations is required [23], [24], [25].

Concerns about data security and privacy have gained prominence in today's digital environment, particularly as educational institutions manage their rising confidence on digitization [109]. In light of this, a thorough examination of the relationship among privacy and data security concerns and the

broader concept regarding educational resilience is necessary [26], [27]. Since it directly affects the long-term sustainability of educational institutions, it is imperative to comprehend this link [110].

At the forefront, putting in place efficient data privacy and security safeguards is crucial to preserving confidence amongst the different stakeholders in the academic community [10,111]. Institutions that place a high priority on protecting student data show that they are dedicated to protecting people's right to privacy and maintaining the privacy of personal data [10]. Building a sustainable learning environment, cultivating goodwill among stakeholders, and raising general involvement all depend on this foundation of trust [28], [29], [30].

Furthermore, maintaining student anonymity is just as important as data privacy and security. Educational institutions can prevent breaches and unwanted access to sensitive data by using strong security measures [36, 112]. In this secure and costly learning atmosphere, students are at ease sharing personal information and actively pursuing their academic goals [31], [32]. In addition to improving educational outcomes, this increased perception of data security also helps students succeed academically over the long term [112].

Additionally, ethical data practices—which are essential to the excellence of education—are tightly associated with the dedication to data privacy and security. Institutions that place a high priority on these factors guarantee the responsible handling of student data in addition to adhering to legal and ethical obligations [33], [34], [35]. These moral issues are essential for protecting people's right to privacy, which raises the legitimacy and integrity of educational establishments [40]. Therefore, Cain et al. [39] contend that institutions can promote a sustainable educational ecosystem that is marked by accountability, fairness, and openness by upholding ethical standards. This dedication to moral behavior not only increases stakeholder trust but also strengthens the educational system's general efficacy and durability [36], [37], [38].

### 3. Methodology

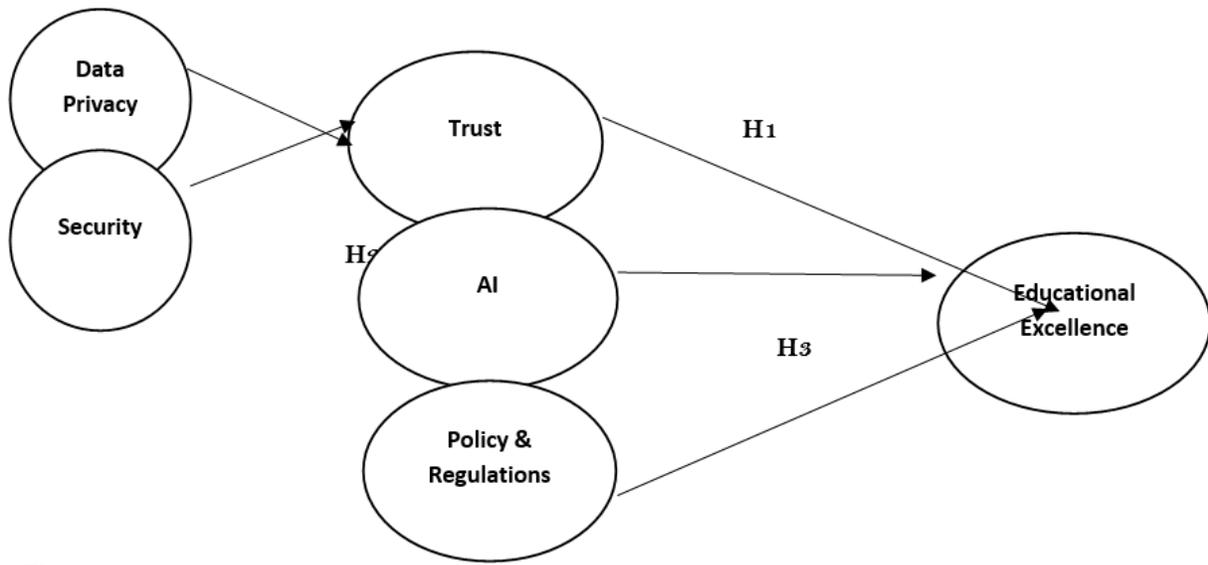
In order to achieve its goals, this study uses a primary data source. Specifically, it looks at the perceived important connections between the adoption of AI, stakeholders' needs, trust and the adaptable effect of laws and regulations on educational excellence [113–116]. As a result, a survey research methodology has been chosen. Institutions in Jordan that have started implementing AI or metaverse technology were given a pre-made questionnaire. The study's theoretical framework, which is based on socio-technical theory, is also supported by the literature review. Scholars are accustomed to using survey research [117, 118]. Several claims drawn from earlier research were used to measure the variables in this study. A 5-point Likert scale was used to evaluate these assertions, with 1 denoting strongly disagree, 2 disagree, 3 neutral, 4 agree, and 5 strongly agree. The proxies or assertions found in the examined literature were carefully used to create the items that were used to measure the components in this study.

The population of students in Jordanian higher education institutions, including both local and foreign students at different educational levels, is the main subject of this study. Accessing the entire number of enrolled students proved to be problematic due to the huge size of this municipal. As a result, the study sought to ascertain the ideal sample size in order to successfully accomplish its goals. A power analysis tool was used to determine the sample size [128, 129]. There were a few things to think about before using the power analysis program. Finding the necessary analytical category—in this case, an F-test—was the first and most important step. One endogenous variable and four external variables were also included in the study. After entering these factors—effect size, error probability, and statistical power—into the power analysis, the program calculated that 266 participants would be the bare minimum needed to carry out the necessary analyses and meet the goals of the study. More samples may be gathered than is necessary in order to account for possible extreme outliers in the replies and to further reduce the probability of Type I or Type II errors. This strategy will contribute to ensuring the findings' dependability and robustness. During the three-month data collection phase, the sample size was cautiously raised to more than 457 individuals in order to boost the research's robustness [130,

131]. The dependability of the study's conclusions is increased by this approach, which guarantees that the study retains a statistically substantial sample size while accounting for possible data anomalies [132].

The actions made by institutions of higher learning to guarantee their long-term survival are referred to in this context as educational excellence. This includes a dedication to student achievement, academic performance, and the general well-being of the education setting. The persistence of the paper is to evaluate how different elements, such as AI adoption and trust, help the institutions studied achieve these excellence objectives. Addressing current issues with data privacy, security, ethics, and the integration of AI in institutional operations [120, 121] is necessary to achieve operational efficiency as well as environmental, social, and economic responsibility [66-69, 119]. In an educational environment that is changing quickly, this strategy is crucial to maintaining institutional resilience and relevance.

In this study, trust is defined as stakeholders' confidence in the establishment's assurance to ethical procedures, accountable information management, and delicate material protection before it is measured. This definition represents the institution's commitment to upholding the rights of its people, acting honorably, and protecting their privacy. Thus, the variable is multi-dimensional and is gauged by data privacy and security issues, as the conceptual study emphasizes [36]. Therefore, in addition to the items created for measurement, definitions of these measurements will be supplied. Data privacy in this setting denotes to the strict fortification of sensitive and personal data against illegal use, access, or disclosure. This is seen as a cornerstone for upholding people's right to privacy, which in turn increases stakeholders' trust in the organization's data management procedures. The establishment's commitment to preserving information truthfulness and confidentiality is referred to as a security concern. This includes worries and considerations about the security and pliability of data, particularly complex data, in contradiction of possible intimidations, openings, or unauthorized access [36]. Eight items will be utilized in order to measure this construct: Four of the topics evaluate data privacy, and the remaining four center on security issues. The planned incorporation and use of AI tools and technology inside the instructive ecology is known as AI adoption in higher education institutions. This involves implementing AI-powered technologies to improve a number of features of the educational process, counting content creation, scholar support, personalized learning, and predictive analytics. Adoption of AI intentions to use data and computerization to expand managerial decisions, streamline educational procedures, and eventually raise the standard of instruction and sustenance services [88]. The objects created for this construct look at how the deployment of AI affects learning outcomes, instructors' use of AI, ethical considerations, learning experiences, educational satisfaction, and learning outcomes while also predicting student retention. Nine objects in all were made for this purpose. Finally, the goal of implementing AI technologies in educational institutions is to improve academic performance [123]. According to this definition, proxies that forecast the application of laws and regulations are included in the items used to measure the construct. The model formulation for this study is illustrated in Figure 1.



**Figure 1.**  
Study theoretical framework.

#### 4. Data Analysis and Findings

For statistical analysis in this paper, PLS-SEM, a kind of structural equation modelling, was utilised. Because of the intricacy of the research model, which incorporates a higher-order construct, this approach was chosen. It might have been difficult to use other statistical analysis techniques in this situation. Furthermore, a strategy that optimizes explained variance was required due to the emphasis on comprehending the connections between latent variables [133]. The analysis differentiated between higher-order and lower-order constructs, as the items employed to measure these constructs were proxies rather than exhaustive items [134].

##### 4.1. Measurement Model Analysis

Determining the concept validity, which includes convergent validity, and the construct reliability, which includes Cronbach's alpha, were critical while analysing the measurement model. Cronbach's alpha values in Table 1 (see below) range from 0.726 to 0.861, which seem to be higher above the threshold of 0.7 for construct dependability (Nunnally and Bernstein, 1994). However, the table's findings confirm the construct's robustness and prove that it is error-free. Given that the Composite Reality (CR) value is between 0.709 and 0.823, it is clear from the table that it is higher than the suggested threshold of 0.7 as put out by Kline (2015). Determining component loading and the Average Variance Extracted (AVE) is a crucial step in evaluating convergent validity. The factor loading values are greater than the customary 0.5 level, as the table demonstrates, and the AVR is likewise above the customary 0.7 threshold, ranging from 0.737 to 0.783. This largely satisfies the conditions for convergent validity and validates the construct validity.

**Table 1.**  
Internal consistency, FA, CR, and AVR tests.

Factor	Item	FA	CR	AVE	Cronbach's Alpha
AI	AI 1	0.625	0.781	0.753	0.861
	AI 2	0.598			
	AI 3	0.719			
	AI4	0.629			
	AI5	0.727			
	AI6	0.608			
	AI7	0.588			
	AI8	0.574			
	AI 9	0.762			
Policy & regulations	PP1	0.645	0.832	0.737	0.799
	PP2	0.628			
	PP3	0.714			
	PP4	0.596			
	PP5	0.781			
	PP6	0.801			
Data privacy	DPR1	0.648	0.714	0.762	0.726
	DPR2	0.675			
	DPR3	0.689			
	DPR4	0.711			
Security	SEC1	0.684	0.709	0.783	0.731
	SEC2	0.702			
	SEC3	0.617			
	SEC4	0.755			
Educational excellence	EE1	0.726	0.765	0.781	0.792
	EE2	0.638			
	EE3	0.785			
	EE4	0.787			
	EE5	0.690			

#### 4.2. Discriminant Validity

Both the Heterotrait-Monotrait (HTMT) ratio and the Fornell-Larcker criterion are applied in this study to evaluate discriminant validity. Finding out how much a construct represents distinctive qualities that set it apart from other constructs is the goal of analyzing discriminant validity. The primary loading in the Fornell-Larcker criterion table should be greater than the successive loadings in its row and neighboring columns, according Hamid et al. This requirement is met, as indicated in Table 2.

**Table 2.**  
Fornell-Larcker criterion.

	AI	P&R	DPR	SEC	EE
AI	0.745				
P&R	0.187	0.775			
DPR	0.265	0.286	0.793		
SEC	0.411	0.178	0.258	0.756	
EE	0.230	0.413	0.373	0.262	0.799

#### 4.2. Structural Model Analysis and Hypothesis Testing

An additional method for assessing hypotheses was provided by this study. In particular, we employ PLS-SEM. The approach to evaluate AI adoption, trust, and policy & regulation effects on educational excellence (EE) is presented in this research. Calcagno et al. (2007) state that conceptual models should be tested and dependent variable predictions should be made using the PLS-SEM model, based on well-established theory. The route analysis in Table 3, which makes use of path coefficients, t-values, and p-values, empirically supports the study's hypotheses. Route coefficient values are classified by Chin (1998) as follows: values above 0.67 are considered strong, values between 0.33 and 0.67 are considered moderate, values between 0.19 and 0.33 are considered weak, and values below 0.19 are not appropriate for further study. The table results show that the AI adoption, trust in technology (by DPR & SEC), and policy & regulations in Jordanian higher institutions have significant impacts on EE. As such, we support H1, 2 and 3.

**Table 3.**  
Structural standardized path coefficients.

Model relations	Std. path coefficient	T-value	P-value	Hs. decision
AI → EE	0.446	4.220 **	0.001	Accepted (+)
Trust (DPR) → EE	0.371	4.015 **	0.007	Accepted (+)
Trust (SEC) → EE	0.254	2.229*	0.024	Accepted (+)
P&R → EE	0.339	3.317*	0.016	Accepted (+)

**Note:** \*p < .05. \*\*p < .01. + (Positive).

## 5. Findings Discussion

In this study, the first hypothesis (H1) examined how trust, as indicated by worries about data security and privacy, would moderate the association between the adoption of AI and the excellence of education. This hypothesis was validated by analyses, which showed that trust has a major impact on how AI adoption affects educational excellence. These results demonstrate how urgently institutions must give data privacy and security procedures top priority in order to build confidence among all parties involved, including parents, teachers, and students. These findings make it clear that organizations aiming to achieve educational excellence need to develop a culture of trust through strong data governance frameworks in addition to implementing AI technologies. Stakeholder trust can be increased and privacy issues can be reduced by ensuring ethical data usage, open communication, and thorough training programs. All things considered, our research sheds light on how technology, trust, and excellence interact in higher education. Long-term success and resilience in the education sector will depend on institutions' ability to comprehend and manage these linkages as they negotiate the challenges of digital change. Future studies could investigate the complex interactions between these characteristics and how various settings affect them.

The adoption of AI and attaining educational excellence in Jordanian higher education institutions are significantly correlated, according to the second hypothesis (H2) of our study. According to our data, there is a strong and significant correlation between higher education institutions' adoption of AI technology and a perceived rise in educational excellence ( $B = 0.446$ ,  $t\text{-value} = 4.220$ ,  $p < 0.01$ ). In particular, educational excellence rises by about 0.446 units for every unit increase in AI adoption. According to these findings, Jordanian higher education institutions' excellence initiatives are probably going to get stronger as they further integrate AI technologies. This supports the body of research showing how AI improves educational methods by enabling better resource management and decision-making. Our findings also highlight the significance of AI as a strategic instrument that can promote quality and excellence practices in educational contexts, in addition to its significance as a technological advancement. Institutions can tackle important issues including raising operational effectiveness, strengthening stakeholder engagement, and improving learning experiences by utilizing AI.

These results are consistent with earlier studies in the field of educational excellence [90–92], which emphasises how AI technologies have the potential to improve the calibre, accessibility, and effectiveness of educational resources and services—all of which are crucial elements of long-term educational systems [88–90, 123, 136]. According to the third hypothesis (H3), there appears to be a substantial association among data policy and regulations and the excellence of education in Jordanian universities. The results of the SEM analysis, which indicate  $B = 0.339$ ,  $t\text{-value} = 3.317$ , and  $p < 0.05$ , supports this theory. This suggests that while respondents acknowledged the crucial role AI technologies play in improving educational excellence in Jordanian universities, they expressed skepticism about the laws and rules controlling the deployment of these technologies as well as their usability. These results are consistent with earlier research by [38, 125, 136], which highlights issues with the connection between regulatory frameworks and clarity.

## 6. Theoretical and Practical Implications

The paper's theoretical ramifications solidify the STSs Theory's role as an important outline for understanding the elaborate relationships between trust, technology adoption, legislation, and regulations in the interest of excellence education. For academics and professionals alike, these implications offer priceless insights that help them better understand the complex relationships that exist between ethical issues, technological developments, and governing obedience in instructive settings. Within the scholarly discourse, the theoretical implications that this investigation yielded are significant. First: Furthermore, the validation of Hypothesis 1, which highlights the importance of trust, particularly with regard to data security and privacy, resonates well with the fundamental ideas of the STSs Theory [75,77]. A crucial and ubiquitous element in the complex structure of socio-technical systems is trust. This highlights the theory's significant focus on the human factor, establishing trust as a key component of data governance and technology adoption [46,74,78]. It draws attention to the theory's holistic viewpoint, which holds that technical improvements and human values, ethics, and trust interact to have a big impact on educational sustainability [83,84].

The confirmation of Hypothesis 2, which finds a strong and substantial correlation between the use of AI technology and the excellence of education, emphasizes how important technological integration is in socio-technical systems, this research highlights the significant impact of technology in forming the educational environment, which is consistent with the fundamental principles of STSs theory [47, 74, 75]. Empirical evidence from the integration of AI technologies shows that AI has the potential to be a key component in maintaining educational systems throughout time, in addition to improving the accessibility and richness of educational resources [77, 79, 80].

On the other hand, the outcome of Hypothesis 3, which indicated that data policy and regulations had significant impact on educational excellence, provides valuable information. This suggests a potential discrepancy between the pace of technology adoption and the efficiency of current regulatory structures. This disparity highlights the intricate dynamics and difficulties of adjusting laws and regulations to the quickly evolving field of educational technology and necessitates additional investigation through the prism of STSs theory. Because of this theoretical discrepancy, regulatory mechanisms need to be reassessed to make sure they appropriately address the complex aspects of AI adoption and its impact on the excellence of education.

The study's practical ramifications highlight the significance of adopting AI with knowledge, strong legal frameworks, trust-building programs, and an all-encompassing approach to data governance. These revelations can help policymakers and educational institutions harness AI's promise for sustainable education, which will eventually benefit students and the educational environment at large.

The paper's deductions have significant implications for legislators and educational institutions alike. First off, this study demonstrates the possible benefits of integrating AI technologies into educational backgrounds by confirming the strong correlation between AI adoption and educational excellence. In order to increase the effectiveness, usability, and caliber of educational resources and services, schools ought to think about implementing AI-driven tools and platforms. To effectively utilize

AI's advantages in advancing sustainable education, however, this goal necessitates funding for AI infrastructure, faculty development, and curriculum revision.

Additionally, the importance of trust in data security and privacy highlights the necessity of establishing and preserving trust between academic institutions, teachers, and students. Strong security measures, open communication of privacy policies, and transparency in data management can all contribute to building confidence. To provide a safe atmosphere where students feel assured about the security of their data, institutions should invest in cybersecurity and encourage ethical data practices.

## 7. Conclusion

In summary, In the context of educational success, this study clarifies the complex relationships between technology adoption, trust, data policies, and legislation. It is based on the STSs Theory. Our results highlight the urgent need for policymakers to reevaluate and explain current regulatory frameworks in order to safeguard educational excellence, while also confirming the transformative possible of AI implementation in improving instructive resources and services. In order to sustain educational systems, trust—particularly with regard to data privacy and security—becomes essential, underscoring the need for openness and robust security protocols. When taken as a whole, these insights help legislators and educational institutions establish an atmosphere where integrating AI is consistent with moral principles, transparent regulations, and confidence, eventually promoting inclusive and sustainable education.

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