Contents lists available at Science-Gate

International Journal of Advanced and Applied Sciences

Journal homepage: http://www.science-gate.com/IJAAS.html

The impact of smart university variables on education quality and sustainable financial performance

Abdul Razzak Alshehadeh *, Ahmad Adel Jamil Abdallah, Ihab Ali El Qirem

Faculty of Business, Al-Zaytoonah University of Jordan, Amman, Jordan

ARTICLE INFO

Article history:
Received 12 November 2024
Received in revised form
2 March 2025
Accepted 17 March 2025

Keywords:
Intelligent university
Learning outcomes
Financial performance
Faculty skills
Sustainability

ABSTRACT

This study investigated the impact of intelligent university dimensions on enhancing learning outcomes and financial performance in Jordanian private universities. A descriptive-analytical approach was used, employing questionnaires distributed to two groups: 385 randomly selected faculty members from 18 universities and all 18 financial managers. A total of 378 completed questionnaires were analyzed. The findings showed a strong influence of intelligent university dimensions on education quality, with 'continuous learning' having the most impact and 'performance pressure' the least. A moderate effect was found on revenue strength, where 'strategic vision' ranked highest and 'desire for change' lowest. Similarly, a moderate impact was observed on return on investment rates, with 'environmental understanding' ranking highest and 'harmony and compatibility' lowest. Additionally, education quality, revenue strength, and return on investment rates were strongly linked. The study highlights the importance of adopting intelligent university practices to enhance learning outcomes, improve faculty skills, and align students' creative abilities with labor market needs, thereby ensuring sustainability and positive cash flow.

1. Introduction

To become highly competitive and achieve quality learning outcomes, educational organizations must adopt methods and techniques that apply educational quality standards both scientifically and practically. Additionally, they should focus on enhancing their financial performance to achieve sustainability and transform into smart organizations (Markus and Philipp, 2018). The application of smart organization dimensions in universities is considered a qualitative and fundamental shift in how educational organizations are managed. Organizations learn and develop through the individuals who work in them and through the experiences of other institutions and communities. The innovative organization is regarded as a system intended to increase intelligence within the organization, with its readiness for development and change, which provides the organization with the ability to deal positively with change (Ayad, 2021). The adoption of smart organization dimensions has a profound impact on how procedures, activities, and work related to employees, implementation, and control of all the university's various activities are considered, as well as the nature of the procedures followed to accomplish work (Ghorbani et al., 2019). A smart organization is defined as the organization's ability to create and use knowledge to develop competitive strategies, particularly for the quality of learning outcomes at both local and global levels (El Talla et al., 2017). Universities must work to lead the kind of strategies that enable them to move towards an era of quality education by transforming themselves into innovative organizations capable of adapting all their capabilities and resources to achieve learning outcomes that match the requirements of the labor market and achieve positive flows that support their perpetuity and continuity.

The success of universities in achieving their long-term strategic goals requires them to possess the dimensions of innovative organizations, giving them leadership and precedence over others in facing and addressing the problems of educational outcomes quality (Moti, 2019). Even though many universities in both private and public sectors do not attach great importance to many of these dimensions in a way that makes them innovative organizations, thus negatively affecting their working mechanisms

* Corresponding Author.
Email Address: abdulrazzaqsh@zuj.edu.jo (A. R. Alshehadeh)
https://doi.org/10.21833/ijaas.2025.03.018
Corresponding author's ORCID profile:
https://orcid.org/0000-0001-5123-6660

to address the problems of learning outcomes quality and the low levels of their service and financial performance (Daniela et al., 2022). As innovative organizations, universities differ from other organizations due to the intense competition in the education sector. Therefore, they must carry out procedures related to continuously rebuilding and renewing their learning outcomes to enhance their competitiveness and increase their levels of adaptation to the requirements of the labor market to achieve a profitable competitive position (Dwaikat, 2021).

Thus, this study aims to demonstrate the impact of the dimensions of universities as smart organizations and their ability to achieve sustainability in the quality of learning outcomes and financial performance. There is a significant increase and intense competition in the number of universities and colleges in Jordan, which requires the existence of a conscious university leadership capable of harnessing all possibilities to attempt to build smart universities that can continue, keep pace with international universities, and achieve excellence in the quality of education and its outcomes while attaining a profitable competitive position.

The reality of Jordanian universities indicates that they face a set of challenges, especially with the increasing demand for university education and the horizontal expansion in the number of universities, which has led to the emergence of some negative effects on the quality of higher education and a decline in the quality of outcomes of some academic programs. Additionally, there has been an increase in university graduates and high unemployment rates due to the weak alignment between learning outcomes and the labor market. This may be attributed to the absence of a mechanism for the continuous development of human cadres in universities capable of dealing with global technological and digital developments, which has made competition fierce with international universities and research centers (Al-Hassan and Houriah, 2021).

Jordanian business organizations suffer from the lack of smart organization requirements in a way that enables them to respond to changes in the business environment. Statistics show that Jordan ranks 70th globally and 9th in the Arab world in the Global Innovation Index (GII) (Al-Quatah, 2022). Many companies have been liquidated due to their inability to adopt smart organization dimensions and keep pace with changes in the surrounding environment. These liquidations reflect an apparent decline in the ability of Jordanian organizations to respond to changing business environment variables (Al-Hassan and Houriah, 2021).

The study by Al-Quatah (2022) indicates that the long-term success of organizations requires them to have dimensions characterized by intelligence and achieve leadership and precedence over others in facing changes in their environment. This requires organizations to search for ways to reach a smart organization. Universities have begun to move towards expanding the use of technology in administrative and educational processes and scientific research. Many universities worldwide have sought to transform into smart universities. These features distinguish them from traditional universities, such as business intelligence tools, the pursuit of global rankings, technological effectiveness, and openness to the global environment. Students and graduates of smart universities are distinguished by several skills and knowledge compared to students and graduates of traditional universities.

Many studies in the Arab and foreign environments have partially addressed some of the variables of the current study, and the results of these studies have been inconsistent and sometimes contradictory to some extent. Ayad (2021) showed that the total degree of availability of smart university requirements at Al-Quds University was moderate. Also, Al-Hassan and Houriah (2021) confirmed the availability of some requirements and components of smart universities in Jordanian universities to a reasonable degree, such as intelligent people, smart management, and smart learning environments. Despite the availability of some smart university requirements and components in Jordanian universities, they need to be developed and improved to be more available. Furthermore, Uskov et al. (2018) found that smart universities provide rich, interactive, and constantly changing educational environments. They work to empower individuals' capabilities and behaviors, encourage them to interact and cooperate, and increase participation and communication between faculty members and students in a framework that makes them participants and responsible for developing and raising the level of the educational process. Moreover, Al-Quatah (2022) concluded that smart universities are not new and have been implemented in many developed countries worldwide, which have achieved outstanding successes in education and knowledge, graduating qualified competencies, and obtaining international accreditations easily. Smart universities are a natural and logical development of e-learning and the wide launch of open-source cloud computing and educational platforms, which have become one of the most important pillars of modern education in universities. Lastly, Al-Kasasbeh et al. (2016) indicated that a smart organization can make smart decisions and adapt quickly to environmental changes.

Based on the above, the study problem can be summarized as follows: Universities in the Jordanian environment have not been tested as to whether they are characterized as smart universities through globally recognized dimensions and whether they have the positive impact they are supposed to have in enhancing the quality of learning outcomes. Therefore, the dimensions of smart universities, education quality, and financial performance are

worthy of research and were chosen as the subject of the current research.

Accordingly, the study problem crystallizes into a set of questions:

1. How do smart-university dimensions impact the quality of education in Jordanian private universities?
2. How do smart-university dimensions impact financial performance in Jordanian private universities?
3. How does education quality impact financial performance in Jordanian private universities?

2. Literature review

2.1. Variables of smart universities

There are several concepts of smart organizations, as they differ from other organizations. From the perspective of Hauptman (2020), a smart organization can produce knowledge and distribute it in all aspects of work within the organization to continuously develop and improve. Dwaikat (2021) views a smart organization as one that creates value through strategic research and development, successfully using modern technologies to become better, faster, and smarter in all main activities. According to Ismiyarto (2018), a smart organization invests in human talents and information technology through a system of institutional values based on creativity, transparency, and modern technologies. El Talla et al. (2017) emphasized that smart organizations can employ various research and development processes to improve overall performance. From the perspective of Ghorbani et al. (2019), smart organizations use long-term strategies to achieve a sustainable position in the long run. On the other hand, Abbas (2020) saw smart organizations as a contemporary approach of importance through its call for change in business organizations by enhancing their independence, relying on electronic technologies, artificial intelligence, competitive development through alliances, decentralization, and training to effectively invest in human capital through building work teams. Ayad (2021) viewed smart organizations as a new approach in contemporary management thought, with importance in encouraging the formation of a new type of organization that encourages and seeks learning. Smart contemporary organizations call for changing how business organizations are managed, considering the implications for learning, development, and training. Furthermore, Al-Quatah (2022) believed that smart organizations are important because they develop alternative future scenarios based on external and internal data to develop their performance. The importance of smart organizations is demonstrated by their ability to control their competitive position in a highly competitive environment. Researchers have differing views on a smart organization's defining variables and characteristics. According to Uskov et al. (2018), a set of dimensions is of great importance in an organization's work to achieve the fundamental goals of smart organizations. The authors of this study agree with what Uskov et al. (2018) stated in identifying the five dimensions of (strategic vision, desire for change, performance pressure, understanding the environment, harmony and compatibility, and continuous learning) as an integrated model for the smart organization, for the following reasons:

1. Most researchers agree on identifying these dimensions, considering the essence of the smart organization, and distinguishing them from other organizations.
2. They can be considered organizational dimensions with their strategic perspective, aiming at renewal, creativity, and keeping pace with successes to create and build individuals' intellectual and cognitive human capabilities. These dimensions are:

- Strategic Vision: Through its vision, the organization expresses its high ability to adapt to environmental changes, organizational rules that encourage continuous learning, high interest in human capital and employee empowerment, knowledge sharing among all, and creative collective thinking in facing problems (Chen et al., 2017). The strategic vision is one of the important and central steps in the organization's strategic management, and it is a basic stage of the strategic management process. The ability to form and develop this vision requires individuals with a keen vision for the future from those with experience, and the strategic goals determine the required changes towards its vision to move the organization towards achieving its goals, especially the quality of learning outcomes (Wariyo, 2020).
- The desire for Change: Smart organizations are organizations that can adapt to various emerging variables, in addition to discovering and seizing available opportunities, facing challenges that threaten their existence, and developing a comprehensive strategy that ensures the achievement of intelligence in the various activities they possess, their sustainability, and their development (Markus and Philipp, 2018). Also, Abbas (2020) adds that the desire for change requires the organization to be fully prepared to implement the changes outlined in the strategic vision and that the development of smart organizations primarily requires the availability of minds distinguished by their intelligence and ability to invest the rest of the resources and harness them in favor of expanding the space of excellence for their organization s because those minds can adapt to changing circumstances.
- Performance Pressure: Performance pressure refers to individuals working in a group, in a team spirit, where they bear each other out for their role

in the organization's success. This helps create a shared feeling of the need to contribute effectively to learning new ways of success and discovering and seizing opportunities. (Uskov et al., 2018) adds that performance pressure refers to the employees' belief in exerting more effort at work and the need to feel what should be accomplished and sincerely believe in its goals, as it is not considered sufficient for managers to perform their tasks, but rather to exert effective efforts to achieve the strategic vision by urging individuals to work at the collective level and exert the utmost degrees of effort in work stemming from belief in the goals and values of the organization.

- Harmony and Compatibility: Harmony and compatibility are defined as restructuring activities and procedures to achieve smart work quickly and respond to emergency changes in the work environment. Harmony and compatibility must include interaction at work, defining responsibilities, and cooperation among employees to achieve the organization's goals (Uskov et al., 2018). Abbas (2020) added that employees must organize themselves for the organization's success in achieving its goals by dividing functions and defining responsibilities. Thus, employees can achieve the mission and interact effectively with each other.
- Understanding the Environment: According to Calma and Dickson-Deane (2020), understanding the environment and its surrounding circumstances is considered one of the basic factors to ensure the sustainability of educational organizations in the long term, as there is a positive relationship between understanding environmental factors and achieving quality in various activities of educational institutions. From the point of view of Cook et al. (2024), understanding the environment is considered one of the basic determinants for controlling cases of uncertainty and helping to achieve the strategic goals of educational institutions, especially improving learning outcomes. Kayyali (2023) added that adapting educational organizations to the working environment will contribute to the formation of smart educational organizations by linking the elements related to information management and organizational learning.
- Continuous Learning: Continuous learning means continuing smartly in the process of acquiring knowledge through experiences and training that lead to a continuous change in the behaviors of the organization and employees, and exploiting that knowledge in a way that enhances the consistency between the organization and its environment (Ismiyarto, 2018). Continuous learning helps the organization generate added value, either by facing changes resulting from the intensity of competition and the speed of technological and technical progress or by realizing that change is the only constant in the life of the organization and that the knowledge of individuals is the result of the change they faced (Wariyo, 2020). Continuous learning means continuity in acquiring knowledge and investing opportunities on how to create greater value, considering competition, rapid technological progress, and scientific and practical changes (Uskov et al., 2018)

2.2. Quality of education

Today, verifying the quality of learning outcomes for educational institutions has gained increasing attention in academic circles in general and universities in particular in various countries of the world. The shift towards quality has become the focus of most reform projects undertaken by higher education institutions to raise their performance levels and improve the quality of educational services provided to students so that they are scientifically and technically ready to serve the goals of their communities.

Learning outcomes and their quality in most universities worldwide are important due to their significant role in developing and preparing qualified graduates for the labor market who have been provided with the necessary knowledge, experiences, and skills (Hikmat and Avan, 2019). Universities play a major role in bringing about societal development in all countries. This role has been affected by the significant and rapid change resulting from technological development in learning outcomes, the impact of globalization on labor markets and its requirements, the emergence of the knowledge age, and the needs of societies that humanity has achieved because of tremendous scientific progress. All this necessitated development in the quality of the university system outputs to fulfill its role correctly according to its specified objectives (Moti, 2019).

The higher education sector in Jordan is considered one of the leading sectors due to its significant and distinctive role in bringing about comprehensive development at various levels and fields, especially considering Jordan's lack of natural resources and the tendency to invest in human resources (Ayad, 2021). Higher education in Jordan has achieved remarkable progress over the past three decades in terms of the diversity of study programs and education patterns that govern quality and quantity, which has been reflected in the quality of learning outcomes for Jordanian universities, despite the limited material capabilities in the kingdom (Al-Quatah, 2022).

Universities, regardless of their organizational form, play an important role in developing cultural awareness among members of society and working to sustain economic, financial, and social life. Their importance lies in their learning outcomes, through the number of certificate holders as well as the quality of outputs represented by qualified human capital that serves society in all its components, which has led to the necessity of paying attention to the quality of learning outcomes (Daniela et al., 2022). Therefore, universities must reconsider their components and elements and work on developing

them to serve a high level of output appropriate to labor market requirements (Yirdaw, 2016).

Educational institutions in general, and universities in particular, as an important part, must seek to provide high-quality educational services to create an attractive educational environment. Consequently, obtaining educational output can effectively contribute to delivering labor market requirements or at least reduce the gap between labor market requirements and the capabilities and qualifications of university graduates.

Several descriptions have been developed to define the concept of quality in higher education. However, many studies indicate that it is difficult to determine the specific meaning of quality in education. Unsurprisingly, multiple parties are participating in or benefiting from university services. According to Pedro et al. (2018), quality can be inferred through student satisfaction in universities, as they are considered the primary client in this case, especially since the student satisfaction rate is an indicator of the extent to which the university achieves the expected goals regarding the quality of the educational level of the services it provides. A high rate of student satisfaction is considered evidence of the university's success in achieving the goals of delivering distinguished educational services that help provide students with knowledge, skills, and competencies. The students have become completely satisfied with their academic achievement, which will later be reflected in their professional lives. If the level of student satisfaction is low, the university has somewhat failed to achieve the desired goals. Consequently, the quality of educational services is inappropriate (Daniela et al., 2020).

There are also several viewpoints on education quality in educational institutions. Pedro et al. (2018) saw that the quality of university services means accuracy and mastery through achieving continuous improvement, while Moti (2019) saw that the quality of university services is represented in a type of unique performance that is achieved only under specific circumstances in a certain quality of students. Lilles and Rõigas (2017) viewed the quality of university services as the ability to positively change students' knowledge and behaviors continuously and add new values according to their understanding and personal growth. Thus, quality refers to a transformative process that elevates students by developing their intellectual abilities to a higher level, allowing them to have a critical view of themselves and their experiences.

Wariyo (2020) saw that there are two concepts for the quality of higher education service: respecting the standards set by the higher education institution, which may express the minimum commitment to quality or standards of excellence, and matching the objectives set by the higher education institution with what has been achieved in learning outcomes.

Jordanian universities, especially public ones, face significant challenges. On the one hand, continuous development and improvement are responsible for raising the level of universities to the level of international universities by targeting qualitative indicators in higher education, scientific research, and development. On the other hand, financial problems and accumulated deficits make them search for quantitative expansion that alleviates material burdens (Al-Hassan and Houriah, 2021). Jordanian public universities are also responsible for developing their activities to become capable of promoting their scientific products, providing expertise, consultancy, and research services on demand in a way that secures resources that achieve self-financial returns that can be reinvested in services (Al-Quatah, 2022).

2.3. Financial performance

Financial performance evaluation is the primary focus of all organizations' efforts, representing one of their most crucial objectives. Organizations are expected to perform their functions efficiently and effectively, and through financial performance evaluation, the strengths and weaknesses in an organization's performance can be identified. Financial performance evaluation is considered one of the most critical factors determining the success of any company, regardless of its nature, to achieve high levels of efficiency in utilizing available economic and financial resources (Oudat et al., 2020).

Measuring financial performance is an ongoing process that should be conducted to take necessary steps to rectify the company's situation in case of deficiencies or to enhance its capabilities. This process enables the company to continue, survive, and develop by revealing weaknesses and flaws in its activities (Al-Shahadah et al., 2023). Thus, investors can assess management efficiency, especially when measured through return on investment (ROI) and earning power indicators, which gauge the company's ability to generate profit from its operational activities by utilizing its working resources and assets (Jyoti and Khanna, 2021).

Earning Power: Earning power is defined as the ability of a specific investment to generate returns because of its use or the company's capacity to generate profits from utilizing its assets in its core activity. Mathematically, it is the ratio of operating activity profit to the company's working assets (Alshehadeh, 2021). Earning power is considered a better measure than profit for assessing a company's adequacy because profit is an absolute figure that does not indicate the size of investments that generated it. In contrast, earning power establishes such a relationship, facilitating comparisons with returns from other periods and companies differing in tax burdens and reliance on borrowing to finance their operations (Jyoti and Khanna, 2021).

Earning power measures the company's operational performance efficiency. Therefore, it is necessary to limit it to assets participating in the company's regular operations when calculating it.

Additionally, net operating profit should be used, focusing solely on profits generated from operating these assets before interest, taxes, and other expenses and revenues (Kılıç et al., 2022).

Return on Investment (ROI): There are numerous measures to evaluate financial performance, but ROI remains one of the most important and principal measures. It possesses distinct advantages, most importantly, its flexibility of use. It can be used in various departments to track the performance of marketing campaigns, purchasing departments, sales departments, or others (Alshehadeh et al., 2022). Consequently, the company can easily measure profitability or performance quality and make improvement decisions.

Understanding ROI is crucial for any company to thrive in the competitive landscape. ROI is a vital metric for measuring the effectiveness of investments and expenditures. ROI is a company's financial return from a specific investment opportunity. It is influenced by factors such as the type of investment, its success and risks, the state of the financial market, and economic changes (Jyoti and Khanna, 2021).

The ROI reflects the profitability of funds invested in companies and measures management performance in managing employed capital. It can also be considered a goal that management seeks to achieve (Al-Shahadah et al., 2023). ROI is an important indicator for evaluating investment performance. Investors can use it to compare returns on different assets or multiple investment opportunities, thus making rational investment decisions (Kılıç et al., 2022).

ROI also helps in measuring investment performance and can be used to identify the most profitable assets and successful investments. Investors and companies can use ROI to evaluate financial performance and improve investment strategies (Kılıç et al., 2022). Furthermore, ROI contributes to promoting economic growth. When investors achieve additional financial returns, they can reinvest those funds in new businesses and projects, supporting innovation and economic development.

3. Methods

3.1. Study population and sample

The study population comprises all 18 private Jordanian universities. The study participants comprised two categories: The first includes all faculty members in these universities, totaling 4,140 members. A random sample of 385 individuals was selected from the total study population, according to the relevant statistical tables (Ahmed, 2024), with a confidence level of 95% and a margin of error of 5%. The second category comprises 18 financial managers who were given the electronic questionnaire. A total of 378 questionnaires were retrieved and subjected to statistical analysis appropriate for the nature of the study.

3.2. Data collection method

The descriptive analytical approach was employed, which aligns with the nature of this study. This method relies on data collection, description, and analysis by designing a questionnaire that covers the study variables. This was done based on reviewing some previous studies that addressed the current study variables, either theoretically or practically, including but not limited to studies by Al-Quatah (2022), Al-Hassan and Houriah (2021), and Ayad (2021). From these studies and others, questionnaire items were extracted and formulated to suit the current study variables and adapted to be consistent with the study objective.

The questionnaire consisted of two main parts: Part One, dedicated to identifying the demographic factors of the respondents (years of experience, academic qualification, administrative title). Part Two: Dedicated to covering the study variables. It was presented to 15 arbitrators from faculty members in various Jordanian universities with experience and competence. The arbitrators' opinions and observations were considered by modifying items that more than 50% of the arbitrators agreed to modify. Consequently, the questionnaire emerged in its final form, consisting of 45 items. The questionnaire was designed electronically to facilitate data collection and analysis. It was distributed to the study population sample, and 378 questionnaires were retrieved and subjected to appropriate statistical analysis using the SPSS program, aiming to identify the impact of smart-university variables on education quality and its effect on the financial performance of private Jordanian universities.

A five-point Likert scale was adopted, consisting of five values from which the respondent chooses one, expressing their agreement on each item's relative importance (strongly agree, agree, moderately agree, disagree, strongly disagree). Regarding the limits adopted by the study to comment on the arithmetic means of the variables in the study model, they were determined at three levels based on the following equation: Interval width = (largest value - smallest value) / number of values = (5-1) / 3 = 1.33

Thus, these levels are divided into Low levels from (1) to (2.33), Medium levels from (2.34) to (3.67), and High levels from (3.68) to (5) (Sekaran, 2019).

3.3. Validity and reliability of the study tool

To verify the construct validity of the questionnaire, it was applied to a pilot sample of 30 faculty members in private Jordanian universities outside the target study sample. The items were analyzed, and Pearson's correlation coefficient was calculated for each item. It was found that the correlation coefficient values for the questionnaire items with their variables ranged between (0.564-0.939), which are values with acceptable degrees

and statistically significant (Sekaran, 2019). Therefore, none of the items were deleted, and the questionnaire enjoys a high degree of internal consistency and validity in the variable items on the scale. Regarding measuring the tool's reliability, the Cronbach's Alpha test was conducted to ensure the level of homogeneity of the questionnaire items. The Cronbach's Alpha coefficient value for the independent variables ranged between (73.9%-78.4%). According to Sekaran (2019), the respondents' answers have a very reasonable degree of credibility. Thus, the results of this study can be generalized to the rest of the study population.

3.4. Study variables

Independent Variable: Smart-university Variables These variables are six variables as follows (Uskov et al., 2018; Ayad, 2021):

- Understanding the environment, denoted by (X1).
- Desire for change, denoted by (X2).
- Harmony and compatibility, denoted by (X3).
- Continuous learning, denoted by (X4).
- Performance pressure, denoted by (X5).
- Strategic vision, denoted by (X6).

1. Mediating Variable: Education Quality, denoted by (X7) (Hauptman, 2020).
2. Dependent Variable: Financial Performance, represented by two indicators:

- Earning power rate, denoted by (Y1).
- Return on investment rate, denoted by (Y2).

3.5. Study hypotheses

There are two sections of hypotheses. The first section relates to hypotheses that measure the elements affecting the financial performance indicator of private Jordanian universities. The second section refers to hypotheses that measure the impact of smart university variables on education quality. These hypotheses are:

H1: There is no statistically significant effect at the level ($\alpha \leq 0.05$) of smart-university variables in private Jordanian universities on their education quality.
H2: There is no statistically significant effect at the level ($\alpha \leq 0.05$) of smart-university variables in private Jordanian universities on their financial performance.
H3: There is no statistically significant effect at the level ($\alpha \leq 0.05$) of education quality in private Jordanian universities on their financial performance.

3.6. Study Measurement Models

To achieve the objectives of this study, the following models were designed:

- The first model measures the impact of smart university variables on education quality:

$$X7_t = \alpha + \beta 1_t + \beta 2\ X1_t + \beta 3\ X2_t + \beta 4\ X3_t + \beta 5\ X4_t + \beta 6\ X5_t + \beta 7\ X6_t + \varepsilon_t$$

- The second model measures the impact of smart university variables on the earnings power rate:

$$Y1t = \alpha + \beta 1t + \beta 2\ X1t + \beta 3\ X2t + \beta 4\ X3t + \beta 5\ X4t + \beta 6\ X5t + \beta 7\ X6t + \varepsilon t$$

- The third model measures the impact of smart university variables on the return on investment rate:

$$Y2t = \alpha + \beta 1t + \beta 2\ X1t + \beta 3\ X2t + \beta 4\ X3t + \beta 5\ X4t + \beta 6\ X5t + \beta 7\ X6t + \varepsilon t$$

- The fourth model measures the impact of the earning power variable on education quality:

$$Y1t = \alpha + \beta 1t + \beta 2\ X7t + \varepsilon t$$

- The fifth model measures the impact of the return-on-investment variable on education quality:

$$Y2t = \alpha + \beta 1t + \beta 2\ X7t + \varepsilon t$$

4. Results

Statistical methods were employed using the Statistical Package for the Social Sciences (SPSS). Specifically, several statistical techniques were utilized, which can be categorized into three primary tests:

1. Descriptive tests for study variables and sample characteristics, primarily relying on measures of central tendency such as arithmetic mean, frequencies, percentages, and standard deviation.
2. Preliminary tests to verify the validity and suitability of data for regression analysis, which is considered a fundamental prerequisite for conducting regression analysis.
3. Linear regression analysis is used to assess the study hypotheses.

4.1. Analysis of preliminary test results for data suitability for regression analysis

Before applying regression analysis, all preliminary tests were conducted to ensure the data met the regression analysis assumptions. The absence of a high correlation between independent variables was confirmed using the Variance Inflation Factor (VIF) and Tolerance tests for each study variable. Care was taken to ensure that the VIF did not exceed the threshold value of 10 and that the Tolerance value was greater than 0.05 (Table 1). Additionally, the normality of data distribution was verified by calculating the Skewness coefficient. The data followed a normal distribution as the Skewness

values ranged between ±1. Consequently, it became possible to proceed with the regression model test.

4.2. Descriptive statistics for study variables

This section of the study describes the study variables. Arithmetic means, standard deviations, and ranks were calculated for the variables to assess the degree of agreement and determine each variable's relative importance, answering the study questions in the order they were presented.

Table 2 shows high interest among Jordanian private universities in smart-university variables. The variable of continuous learning ranked first, while performance pressure ranked last. Table 2 also indicated high interest among Jordanian private universities in education quality and financial performance with its variables. There is high arithmetic evidence for these variables and a low standard deviation among the responses of the study population. Testing the First Hypothesis: H01*:* There is no statistically significant effect at the level ($\alpha \leq 0.05$) of smart-university variables in Jordanian private universities on their education quality. Table 3 demonstrates a strong effect of the combined variables of the smart university on the quality of education in Jordanian private universities. This is evident from the correlation coefficient (R) value of 80.7%. Additionally, the coefficient of determination ($R^2 = 0.647$) indicates that applying smart-university variables to Jordanian private universities explains 64.7% of the variance in education quality.

The results in Table 3 indicate a statistically significant effect of smart university variables on education quality in Jordanian private universities. This is demonstrated by the p-value of 0.00, less than 0.05, and the F value of 72.276, greater than its critical value of 2.68. This also represents the significance of this model at a degree of freedom [(K-1) – (N-1)] = (4/105). Table 3 shows that all combined variables of the smart university influence the dependent variable (education quality), as evidenced by the probability value (Sig) for all variables being less than 0.05. Additionally, the calculated T values for all variables are greater than their critical value of 1.982. We observe that the variable of "continuous learning" ranked first in terms of impact, as indicated by the beta coefficient value ($\beta = 0.389$) in a positive direction. The "performance pressure" variable ranked last, with a beta coefficient value of ($\beta = 0.302$), also in a positive direction. Based on the data presented in Table 3, we accept the alternative hypothesis (Ha), which states: There is a significant effect at the level of ($\alpha \leq 0.05$) of smart-university variables in Jordanian private universities on the quality of education.

Testing the Second Hypothesis: H02: There is no significant effect at the level of ($\alpha \leq 0.05$) smart-university variables in Jordanian private universities on their revenue strength.

Table 1: Results of variance in inflation factors, tolerance, and skewness tests

Independent variables	VIF	Tolerance	Skewness
Understanding the environment	2.12	0.381	0.245
Desire for change	2.71	0.322	0.446
Harmony and compatibility	2.64	0.391	0.459
Continuous learning	1.44	0.561	0.530
Performance pressure	2.73	0.359	0.437
Strategic vision	2.82	0.431	0.364

Table 2: Description of study variables

Number	Variable	Arithmetic mean	Standard deviation	Rank	Level
1	Understanding the environment	3.695	0.687	3	High
2	Desire for change	3.632	0.854	4	High
3	Harmony and compatibility	3.549	0.931	5	High
4	Continuous learning	3.776	0.705	1	High
5	Performance pressure	3.431	0.826	6	High
6	Strategic vision	3.714	0.618	2	High
-	Educational quality	3.764	0.916	-	High
-	Revenue strength	3.634	0.563	-	High
-	Return on Investment	3.716	0.712	-	High

Table 3: Results of multiple linear regression analysis for testing the first hypothesis

Dependent variable	Model summary		Analysis of variance			Coefficients table					
	R	R^2	F	P-value	DF	Independent variables	B	Standard error	Beta	T-calculated	P-value
X7	0.807	0.647	72.276	0.000	105/4	X1	0.275	0.071	0.307	4.263	0.00
						X2	0.251	0.058	0.331	4.350	0.00
						X3	0.301	0.078	0.328	3.700	0.00
						X4	0.207	0.098	0.389	2.874	0.00
						X5	0.342	0.087	0.302	3.154	0.00
						X6	0.214	0.621	0.318	2.982	0.00

Table 4 indicates a moderate effect of the combined smart-university variables on the revenue strength in Jordanian private universities. This is evident from the correlation coefficient (R) value of 38.4%. Furthermore, the coefficient of determination ($R^2 = 0.241$) suggests that applying smart-university variables in Jordanian private universities explains 24.1% of the variance in revenue strength. The results in Table 4 demonstrate a statistically significant effect of the combined smart-university variables on the revenue strength in Jordanian private universities. This is shown by the p-value of

0.00, less than 0.05, and the F value of 65.245, which exceeds its critical value of 2.68. This also represents the significance of this model at a degree of freedom [(K-1) – (N-1)] = (4/105).

Table 4: Multiple linear regression analysis results to test the second hypothesis.

Dependent variable	Model summary		Analysis of variance			Coefficients table					
	R	R^2	F	P-value	DF	Independent variables	B	Standard error	Beta	T-calculated	P-value
Y1	0.384	0.241	65.245	0.000	105/4	X1	0.227	0.054	0.354	5.234	0.00
						X2	0.286	0.059	0.277	3.589	0.00
						X3	0.304	0.067	0.327	3.824	0.00
						X4	0.263	0.072	0.358	4.594	0.00
						X5	0.287	0.095	0.261	4.295	0.00
						X6	0.247	0.078	0.374	3.529	0.00

Table 4 reveals that all smart-university variables influence the dependent variable (revenue strength), as evidenced by the probability value (Sig) for all variables being less than 0.05. Additionally, the calculated T values for all variables are greater than their critical value of 1.982. We observe that the "strategic vision" variable ranked first in terms of impact, as indicated by the beta coefficient value (β = 0.374), which is in a positive direction. The "desire for change" variable ranked last, with a beta coefficient value of (β = 0.277), also in a positive direction. Based on the data presented in Table 4, we accept the alternative hypothesis (Ha), which states: There is a significant effect at the level of (α ≤ 0.05) of smart-university variables in Jordanian private universities on their revenue strength. Testing the Third Hypothesis: H03: There is no significant effect at the level of (α ≤ 0.05) smart-university variables in Jordanian private universities on their return on investment rate. The analysis of the data presented in Table 5 reveals a moderate effect of the combined variables of the smart university on the return on investment (ROI) in Jordanian private universities. This is evidenced by the correlation coefficient (R) of 32.8%. Furthermore, the coefficient of determination (R^2 = 0.206) indicates that implementing smart-university variables in Jordanian private universities accounts for 20.6% of the variance in the ROI. The results demonstrate a statistically significant impact of the collective smart-university variables on the ROI in Jordanian private universities. This is supported by the F-value (896.45), which exceeds the critical value of 2.68, and the corresponding p-value (F. Sig) of 0.00, below the 0.05 significance threshold. These findings confirm the model's significance at degrees of freedom [(K-1) – (N-1)] = (4/105).

Table 5: Multiple linear regression analysis results to test the third hypothesis

Dependent variable	Model summary		Analysis of variance			Coefficients table					
	R	R^2	F	P-value	DF	Independent variables	B	Standard error	Beta	T-calculated	P-value
Y2	0.328	0.206	896.45	0.000	105/4	X1	0.358	0.077	0.391	3.534	0.00
						X2	0.273	0.095	0.332	4.587	0.00
						X3	0.342	0.073	0.304	4.163	0.00
						X4	0.276	0.058	0.317	3.810	0.00
						X5	0.249	0.083	0.341	3.726	0.00
						X6	0.237	0.096	0.359	4.084	0.00

All variables of the smart university contribute significantly to the dependent variable (ROI), as evidenced by their respective p-values (Sig) being less than 0.05 and their calculated t-values exceeding the critical value of 1.982. Notably, the "understanding the environment" variable exhibits the strongest influence, with the highest standardized beta coefficient (β = 0.391) in a positive direction. Conversely, the "harmony and compatibility" variable shows the least impact, with a beta coefficient of 0.304, and is also in a positive direction.

Based on these findings, we reject the null hypothesis and accept the alternative hypothesis (Ha), which states: "There is a statistically significant effect at the level of (α ≤ 0.05) of smart-university variables in Jordanian private universities on their return on investment."

The study examines the fourth hypothesis: H04: There is no statistically significant effect at the level of (α ≤ 0.05) education quality in Jordanian private universities on their revenue strength.

The data presented in Table 6 are analyzed, revealing a strong effect of education quality on revenue strength in Jordanian private universities. This is evidenced by the correlation coefficient (R) of 74.6%. Furthermore, the coefficient of determination (R^2 = 0.563) indicates that education quality in Jordanian private universities accounts for 56.3% of the variance in revenue strength. The results demonstrate a statistically significant impact of education quality on revenue strength in Jordanian private universities. This is supported by the F-value (41.251), which exceeds the critical value of 2.68, and the corresponding p-value (F. Sig) of 0.00, below the 0.05 significance threshold. These findings confirm the model's significance at degrees of freedom [(K-1) – (N-1)] = (4/105). The education quality variable significantly contributes to the dependent variable (revenue strength), as evidenced by its p-value (Sig) being less than 0.05 and its calculated t-value exceeding the critical value of 1.982. Based on these findings, we reject the null hypothesis and accept the alternative hypothesis

(Ha), which states: "There is a statistically significant effect at the level of (α ≤ 0.05) of education quality in Jordanian private universities on their revenue strength."

Table 6: The results of the simple linear regression analysis to test the fourth hypothesis

Dependent variable	Model summary		Analysis of variance			Coefficients table					
	R	R^2	F	P-value	DF	Independent variables	B	Standard error	Beta	T-calculated	P-value
Y1	0.746	0.563	41.251	0.000	105/4	X7	0.313	0.083	0.356	7.483	0.00

The study proceeds to examine the fifth hypothesis:H05: There is no statistically significant effect at the level of (α ≤ 0.05) education quality in Jordanian private universities on their return on investment. The data reveal a strong effect of education quality on the return on investment (ROI) in Jordanian private universities, as evidenced by the correlation coefficient (R) of 58.3%. The coefficient of determination (R^2 = 0.376) indicates that education quality in Jordanian private universities accounts for 37.6% of the variance in ROI (Table 7). The results demonstrate a statistically significant impact of education quality on ROI in Jordanian private universities. This is supported by the F-value (37.821), which exceeds the critical value of 2.68, and the corresponding p-value (F. Sig) of 0.00, below the 0.05 significance threshold. These findings confirm the model's significance at degrees of freedom [(K-1) – (N-1)] = (4/105).

Table 7: presents the results of the simple linear regression analysis to test the fifth hypothesis

Dependent variable	Model summary		Analysis of variance			Coefficients table					
	R	R^2	F	P-value	DF	Independent variables	B	Standard error	Beta	T-calculated	P-value
Y2	0.583	0.376	37.821	0.000	105/4	X7	0.372	0.096	0.308	12.573	0.00

The education quality variable significantly contributes to the dependent variable (ROI), as evidenced by its p-value (Sig) being less than 0.05 and its calculated t-value exceeding the critical value of 1.982.

Based on these findings, we reject the null hypothesis and accept the alternative hypothesis (Ha), which states: "There is a statistically significant effect at the level of (α ≤ 0.05) of education quality in Jordanian private universities on their return on investment."

This analysis underscores the importance of education quality as a significant factor influencing the financial performance of Jordanian private universities, specifically the return on investment. The strong positive relationship between these variables suggests that investments in improving education quality may lead to enhanced financial returns for these institutions.

5. Discussion

The significance of this study lies in its exploration of a vital topic for all contemporary universities. The adoption and implementation of smart university dimensions affect numerous organizational, administrative, and financial aspects, which can contribute to improving the quality of learning outcomes and enhancing the educational process to produce outputs that align with the changing requirements of the labor market. Additionally, it can reduce discontinuity risks by achieving acceptable profitability levels. The importance of the study is also demonstrated through its emphasis on pioneering organizational and administrative issues that are considered the backbone of contemporary universities' sustainability, such as financial performance sustainability, smart university dimensions, and quality of education. This study tested and measured the impact of smart dimensions on the quality of education and their effect on the sustainability of financial performance in Jordanian private universities. This study's results will contribute strongly to the ongoing debate in previous studies regarding the impact of smart university dimensions on the quality of learning outcomes and their effect on the sustainability of financial performance in Jordanian private universities. Previous studies have disparate and sometimes contradictory results concerning the relationship and role played by smart-university dimensions in achieving quality education and its impact on financial performance. Several studies in the Arab and foreign environments have partially addressed some of the variables of the current study, albeit with differences in methodology and variables. These studies include (Al-Quatah, 2022), which emphasizes that the long-term success of organizations requires the availability of smart dimensions that enable them to achieve leadership and precedence over others in facing changes in their environment. This requires organizations to search for ways to become smart organizations. Ayad (2021) confirmed that applying smart organization dimensions in universities is considered a qualitative and fundamental shift in how educational organizations are managed. On the other hand, Abbas (2020) concluded that smart organizations are a contemporary approach of importance through their call for change in business organizations by enhancing their independence, relying on electronic technologies, artificial intelligence, and competitive development through alliances, decentralization, and training, to invest in human capital through building work teams effectively. In the same context, the study by Ghorbani et al. (2019) confirmed that a smart organization can create and use knowledge to

develop competitive strategies, especially strategies for the quality of learning outcomes at the local level.

The authors of this study recognize that its results may have a set of subjective limitations, the foremost of which is the choice of the random sampling method, which has no alternative considering using the electronic questionnaire approach to obtain information. Additionally, this study may have another limitation related to the seriousness of the study population in answering the study questions. However, despite these subjective limitations, the authors believe they do not affect the scientific and applied value of the study's results.

The findings of the current study indicate that the availability and adoption of smart university dimensions tested in this study by Jordanian private universities can contribute to controlling many negative aspects in the quality of the current educational process outputs, especially smart knowledge systems, the digital economy, and the use of smart systems to improve production efficiency in all fields. The results also confirm that the adoption of smart university dimensions by Jordanian private universities contributes to reducing unemployment rates among graduates from these universities, thanks to the compatibility of the quality of learning outcomes with the changing and renewed requirements of the current labor market.

On the other hand, the study's findings suggest that the availability of smart university dimensions in Jordanian private universities can improve productivity in all areas, especially their financial performance. This will contribute to the sustainability of their work and the achievement of their short—and long-term strategic goals.

6. Conclusion

For Jordanian private universities to transform into smart universities, they must adopt organizational and administrative dimensions that lead them to become categories of smart universities. This should be accompanied by a shift in the digital infrastructure, technologically equipped buildings, and a commitment to attracting administrative and educational staff with high technological skills and abilities. It is also crucial to train faculty members on smart technologies and systems and build an e-learning portal that serves as a unified interface for providing all the services offered by the university. Additionally, providing smart learning environments that align with a radical and gradual change in the strategic vision of these universities is essential, with the aim of continuity in activity and achieving objectives.

This goal will only be achieved through the existence and achievement of sustainable profitability rates, as financial performance indicators are among the most important tools for evaluating these universities from a financial perspective, foremost of which are the indicators of revenue strength and return on investment. In line with the study's results, it is necessary to emphasize the need for Jordanian private universities to adopt the idea of a smart university and apply the requirements of its dimensions mentioned in this study to keep pace with progress and improve the quality of their learning outcomes. This can be done by raising the efficiency and skills of faculty members in modern technology and techniques, enabling them to fully employ them in the teaching process while relying on e-learning and active learning. Consequently, this will improve and develop students' creative skills to align with the changing requirements of the labor market. This would help the universities sustain and continue their work and achieve positive cash flows.

List of abbreviations

SPSS	Statistical package for the social sciences
VIF	Variance inflation factor
ROI	Return on investment
DF	Degrees of freedom
R	Correlation coefficient
R^2	Coefficient of determination
F	F-statistic used in analysis of variance
B	Unstandardized coefficient
β (Beta)	Standardized coefficient
P-value	Probability value used for significance testing
X1	Understanding the environment
X2	Desire for change
X3	Harmony and compatibility
X4	Continuous learning
X5	Performance pressure
X6	Strategic vision
X7	Education quality
Y1	Earning power rate
Y2	Return on investment rate
α	Significance level
εt	Error term in regression models

Compliance with ethical standards

Ethical considerations

The study was conducted in accordance with the ethical standards of research involving human participants. Participation was voluntary, and informed consent was obtained from all respondents. The data were collected anonymously and kept confidential.

Conflict of interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

References

Abbas AA (2020). Educational competition as a moderating variable of the relationship between electronic management and intelligent organizations. Revista Tempos e Espaços em Educação, 13(32): 1-25. https://doi.org/10.20952/revtee.v13i32.13173

Ahmed SK (2024). How to choose a sampling technique and determine sample size for research: A simplified guide for

researchers. Oral Oncology Reports, 12: 100662. https://doi.org/10.1016/j.oor.2024.100662

Al-Hassan M and Houriah AH (2021). Smart university requirements and the degree of availability in Jordanian universities from the students' perspectives. M.Sc. Thesis, Middle East University, Amman, Jordan.

Al-Kasasbeh MM, Al-Kasasbeh SA, and Al-Faouri AH (2016). Smart organization characteristics and its impact on social and environmental performance: An empirical study on Jordan phosphate mines company. International Journal of Business and Management, 11(8): 106-115. https://doi.org/10.5539/ijbm.v11n8p106

Al-Quatah A (2022). The producing university: A proposed formula for the development of Jordanian university education to reach globalization. International Journal of Quality Assurance, 5(2): 94-114. https://doi.org/10.34028/ijqa/5/2/240

Al-Shahadah AR, Al-Sraheen DA-D, and Khudari M (2023). The earnings management in Jordanian banks: Do profitability measures matter? In: Alareeni B and Hamdan A (Eds.), Sustainable finance, digitalization and the role of technology: Lecture Notes in Networks and Systems. Volume 487, Springer, Cham, Switzerland. https://doi.org/10.1007/978-3-031-08084-5_24

Alshehadeh AR (2021). The relationship between liquidity risk and profitability in the commercial banks listed in Amman stock exchange. In the 2021 International Conference on Information Technology, IEEE, Amman, Jordan: 257-261. https://doi.org/10.1109/ICIT52682.2021.9491702

Alshehadeh AR, Elrefae G, and Injadat E (2022). Influence of traditional performance indicators on economic added value: Evidence from insurance companies. Corporate Governance and Organizational Behavior Review, 6(4): 18-27. https://doi.org/10.22495/cgobrv6i4p2

Ayad M (2021). The availability of smart university requirements at Al-Quds University. M.Sc. Thesis, Al-Quds Open University, Ramallah, Palestine.

Calma A and Dickson-Deane C (2020). The student as customer and quality in higher education. International Journal of Educational Management, 34(8): 1221-1235. https://doi.org/10.1108/IJEM-03-2019-0093

Chen I-S, Chen JK, and Padró FF (2017). Critical quality indicators of higher education. Total Quality Management and Business Excellence, 28(1-2): 130-146. https://doi.org/10.1080/14783363.2015.1050178

Cook S, Watson D, and Webb R (2024). Performance evaluation in teaching: dissecting student evaluations in higher education. Studies in Educational Evaluation, 81: 101342. https://doi.org/10.1016/j.stueduc.2024.101342

Daniela O, Correia L, and da Conceição Rego M (2020). The main challenges of higher education institutions in the 21st century: A focus on entrepreneurship. In: Daniel AD, Teixeira AA, and Preto MT (Eds.), Examining the role of entrepreneurial universities in regional development: 1-23. IGI Global, Hershey, USA. https://doi.org/10.4018/978-1-7998-0174-0.ch001

Daniela O, Correia L, and Rego C (2022). How to develop higher education curricula towards employability? A multi-stakeholder approach. Education + Training, 64(1): 89-106. https://doi.org/10.1108/ET-10-2020-0329

Dwaikat NY (2021). A comprehensive model for assessing the quality in higher education institutions. The TQM Journal, 33(4): 841-855. https://doi.org/10.1108/TQM-06-2020-0133

El Talla SA, Abu-Naser SS, Abu Amuna YM, and Al Shobaki MJ (2017). Technical colleges as smart organizations and their relationship to sustainability. In the 2nd Scientific Conference on Sustainability and Enhancing the Creative Environment of The Technical Sector, Palestine Technical College, Deir Al Balah, Gaza, Palestine.

Ghorbani A, Danaei A, Zargar M, and Hematian H (2019). Designing of smart tourism organizations (STO) for tourism management: A case study of tourism organizations of South Khorasan Province Iran. Heliyon, 5(12): e02964. https://doi.org/10.1016/j.heliyon.2019.e01850 **PMid:31338444 PMCid:PMC6579854**

Hauptman KM (2020). Discourses on quality and quality assurance in higher education from the perspective of global university rankings. Quality Assurance in Education, 28(1): 78-88. https://doi.org/10.1108/QAE-05-2019-0055

Ismiyarto SH and Si M (2018). Organization intelligence and bureaucracy reform at public organization in Indonesia. Modern Applied Science, 12(2): 93-108. https://doi.org/10.5539/mas.v12n2p93

Jyoti G and Khanna A (2021). Does sustainability performance impact financial performance? Evidence from Indian service sector firms. Sustainable Development, 29(6): 1086–1095. https://doi.org/10.1002/sd.2204

Kayyali M (2023). An overview of quality assurance in higher education: concepts and frameworks. International Journal of Management, Sciences, Innovation, and Technology, 4(2): 1–4.

Kılıç M, Gurler HE, Kaya A, and Lee CW (2022). The impact of sustainability performance on financial performance: Does firm size matter? Evidence from Turkey and South Korea. Sustainability, 14(24): 16695. https://doi.org/10.3390/su142416695

Lilles A and Rõigas K (2017). How higher education institutions contribute to the growth in regions of Europe? Studies in Higher Education, 42(1): 65–78. https://doi.org/10.1080/03075079.2015.1034264

Markus S and Philipp P (2018). Assessing quality assurance in higher education: Quality managers' perceptions of effectiveness. European Journal of Higher Education, 8(3): 258–271. https://doi.org/10.1080/21568235.2018.1474777

Moti G (2019). Quality education assessment in private higher education institutions: The case of private higher education institutions at Mekelle, Tigray Regional State. In the Proceedings of the 16th International Conference on Private Higher Education in Africa, St. Mary's University, Addis Ababa, Ethiopia: 263-293.

Oudat M, Hasan H, and Alsmadi A (2020). Macroeconomic variables and portfolio investment in Bahrain using an ARDL bound testing approach. Accounting, 6(4): 465–472. https://doi.org/10.5267/j.ac.2020.4.0012

Pedro E, Mendes L, and Lourenço L (2018). Perceived service quality and student's satisfaction in higher education: The influence of teaching methods. International Journal for Quality Research, 12(1): 165–192.

Sekaran U (2016). Research methods for business: A skill building approach. 8th Edition, John Wiley and Sons, New York, USA.

Uskov V, Bakken J, Howlett R, and Jain L (2018). Smart universities: Concepts, systems and technologies. In: Uskov VL, Howlett RJ, and Jain LC (Eds.), Smart education and smart e-learning. Volume 41, Springer, Berlin-Heidelberg, Germany. https://doi.org/10.1007/978-3-319-59454-5

Wariyo LG (2020). Higher education quality assessment in Ethiopia: A comparative study. Multidisciplinary Journal for Education, Social and Technological Sciences, 7(1): 1-31. https://doi.org/10.4995/muse.2020.10512

Yirdaw A (2016). Quality of education in private higher institutions in Ethiopia: The role of governance. SAGE Open, 6(1): 1–12. https://doi.org/10.1177/2158244015624950