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# Activating the Value Chain in Algerian Universities Through Porter's Perspective: A Strategic Approach to Digital Transformation

**Asma Djeddi**
University of Tipaza, Algeria
Human Capital and Performance Laboratory
Djeddi.asma@univ-tipaza.dz
**Hakima Mokhtar Rahmani**
University of Algiers 3, Algeria
Human Capital and Performance Laboratory
mokhtarrahmani.hakima@univ-alger3.dz

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**Abstract**
This study examines the role of activating the value chain, from Porter's perspective, in Algerian universities as a strategic approach to supporting digital transformation. The importance of the research lies in understanding how value-chain components enhance digital efficiency within universities and how they affect institutional capacity to adapt to the requirements of the contemporary educational environment. A descriptive, analytical, and quantitative approach was adopted. Data were collected through a questionnaire administered to a purposive sample of 179 university teachers and analysed using exploratory factor analysis, specifically principal component analysis. The results revealed a positive and statistically significant relationship between value-chain activation and digital transformation. High factor loadings for service, operations, marketing, infrastructure, and inbound logistics indicate that these dimensions constitute fundamental pillars of digital efficiency. The findings also show that the impact of the value chain varies according to university characteristics: institutions with stronger infrastructure and resources achieve better outcomes than those with limited capacity. The study confirms that the value chain is a pivotal strategic tool for guiding universities' digital transformation efforts by strengthening physical and digital infrastructure, developing human capacities, improving internal operations, and activating marketing and communication mechanisms, thereby ensuring the efficiency and sustainability of this transformation.
***Keywords:*** value chain; digital transformation; Algerian universities; infrastructure
*JEL classification:* I23; O32

## Introduction

Higher education worldwide is undergoing profound transformation as a result of rapid digitalisation. The adoption of innovative strategies has therefore become essential for enhancing university competitiveness and improving institutional performance. In this context, Porter's value chain provides a strategic analytical framework for understanding primary and support activities within institutions, identifying sources of value creation, and highlighting areas of strength and weakness.

Although the value chain was originally developed for economic institutions, adapting it to Algerian universities offers a promising way to understand mechanisms of value creation in an academic environment marked by complex challenges and increasing pressures associated with digital transformation. The central research question is therefore as follows:

How can the value chain be activated, from Porter's perspective, in Algerian universities as a strategic approach to digital transformation?

To answer this question, the study formulates the following hypotheses:

- Hypothesis 1: There is a statistically significant relationship between the level of value-chain activation and digital transformation in Algerian universities.
- Hypothesis 2: The impact of value-chain activation on digital transformation varies according to university characteristics, particularly resources and infrastructure.

The study has several objectives, the most important of which are to highlight the value chain as a strategic tool for understanding university activities, clarify its role in supporting digital transformation projects, and propose an applied approach that contributes to the formulation of more effective policies. The study assumes that integrating university activities within the value-chain framework enhances competitiveness, improves the quality of educational and research services, and optimises the direction of digital investments.

The study adopts a descriptive-analytical approach, as this is appropriate for examining educational and administrative phenomena within Algerian universities. A questionnaire was used as the primary data-collection tool and was administered to a purposive sample of 179 university teachers. The resulting quantitative data were processed using advanced statistical methods, particularly principal component analysis (PCA), in order to reveal the latent dimensions of the study variables and interpret their relationships systematically.

The study is supported by comparisons with previous research on the value chain and digital transformation in higher education. Although these studies share an interest in value creation or digital transformation, they differ in purpose and method. Akacem (2010), for example, focused on rationalising costs in industrial economic institutions, a sample and field that differ substantially from universities. Al-Khanbashi and Al-Omari (2023) highlighted the role of the value chain in enhancing competitive advantage in higher education, but their work was limited to theoretical analysis and did not rely on a broad field sample. Dorri (2012) and Öncer (2018) addressed foreign universities from conceptual and analytical perspectives without

conducting field surveys and were limited to proposing applied models. Other studies examined digital transformation in economic institutions (Bharadwaj et al., 2013; Westerman et al., 2014) but did not link it to the university value chain.

By contrast, the present study combines an applied field dimension with the integration of value-chain and digital-transformation concepts in the context of Algerian universities. It therefore offers more precise results that reflect the local reality and contributes qualitatively to the relevant literature.

The article is organised into two main sections. The first discusses the theoretical aspects of the value chain and digital transformation in universities. The second presents the applied methodology, including the collection and analysis of field data in relation to the research objectives.

## The Value Chain and Digital Transformation in Universities

### Digital Transformation as a Strategic Option for Universities

#### *The Concept of Digital Transformation as a Strategic Option*

Digital transformation is a strategic option that goes beyond the mere use of modern technologies. It aims to reshape business models, internal processes, and methods of value creation within institutions. Its success also depends on integrating digital technology with organisational and strategic innovation in a manner that enhances competitiveness, improves knowledge management and customer experience, and develops organisational competencies in line with future change (Westerman et al., 2014, p. 9).

Bharadwaj et al. (2013) consider digital transformation a dynamic capability that enables institutions to adapt to environmental changes by leveraging digital infrastructure to develop innovative strategies. It contributes to operational excellence through automation and advanced analytics, while also opening new opportunities for growth through digital platforms and smart services (p. 472).

### The Value Chain According to Porter and Its Importance in Educational Institutions

#### *The Concept of the Value Chain From Porter's Perspective*

According to Kotler's definition, the value chain is a tool for identifying the sources through which the value delivered to beneficiaries can be increased. MacMillan and Tampoe add that the basic concept of the value chain lies in achieving the highest possible value at the lowest possible cost, while measuring the added value and profit generated by each part of the chain and determining the extent of cost improvements (Al-Khanbashi & Al-Omari, 2023, p. 327).

Porter introduced the value chain as an interconnected set of activities through which an institution produces and delivers value to the final beneficiary. These activities are divided into primary activities, such as production, marketing, and after-sales service, and support activities, such as human-resource management, technology development, and infrastructure. Value-chain

analysis helps institutions understand the contribution of each activity to value creation and identify opportunities for improvement and development, thereby enhancing institutional performance, competitive advantage, and profitability (Porter, 1985, p. 36).

The preceding definitions show that the value-chain concept focuses on identifying the primary and support activities that contribute to value creation. These activities are key sources for achieving maximum benefit for beneficiaries at the lowest possible cost, helping institutions acquire competitive advantage and ensure continuity.

***Adapting Primary and Support Value-Chain Activities to Universities***

Porter's value-chain approach is a systematic analytical framework for understanding institutional activities, whether primary or support activities. It enables leaders and officials to identify sources of added value and direct resources towards the activities with the greatest impact on institutional performance (Porter, 1985, p. 36).

The literature shows differences in the classification of value-chain activities. Banker et al. divide them into input activities, namely research and development, design, and purchasing; operational activities, namely production and storage; and output activities, namely distribution and marketing. They also identify administrative support activities, such as human resources and data processing. Donelan and Kaplan, by contrast, propose a simpler classification based on the distinction between primary and secondary activities (Akacem, 2010, p. 95). Despite these differences, the classifications converge on the need to distinguish between activities that contribute to value creation and those that do not add tangible value.

In universities, the value-chain approach enhances innovation in teaching methods, cooperation between faculties, and improvements in the educational environment, all of which positively affect local and international competitiveness (Al-Khanbashi & Al-Omari, 2023, p. 327). This adaptation underscores the importance of linking practical theory with real-world application to achieve stronger institutional performance.

Dorri (2012) argues that information and communication technology plays an essential role in supporting the value chain in higher education, as it helps integrate educational, research, and community-service activities through integrated systems. The E-College model illustrates this role through the automation of administrative and educational processes, the improvement of communication, and knowledge management, thereby increasing performance efficiency and enhancing universities' added value (pp. 3843-3844).

Dorri (2012) also argues that Porter's value-chain model cannot be applied to universities in its original form because universities are service-based and knowledge-based institutions and some components of the original model do not apply directly to them. In higher education, value is concentrated in teaching, research, and community service; therefore, a model suited to this sector is required (p. 3844).

The adoption of the value chain in higher education is therefore a strategic approach to improving performance through the efficient management of activities and the effective use of technology, governance, and stakeholder interaction, thereby supporting sustainable competitive advantage.

## Applied Methodology of the Study

### Descriptive Analysis of Variables and Tests of Internal Consistency and Statistical Correlation

#### *Description of the Study Variables*

The sample is distributed according to two personal variables: age and teaching experience. Because the selected participants are university teachers, educational level was not included as a variable.

Regarding age, the results show that 85.5% of the sample were aged 30-50, indicating that most participants belong to the middle-age group, which is generally the most active and academically experienced. By contrast, participants under the age of 30 represented only 2.7% of the sample, while those over 50 represented 11.7%.

Regarding teaching experience, the sample consisted of 179 teachers. Participants with more than 10 years of experience represented the largest group (40%), followed by those with 5-10 years of experience (29%) and those with less than 5 years of experience (31%). This distribution reflects diversity in professional experience within the sample.

### Measurement of Statistical Correlation and Verification of Suitability for Exploratory Analysis

#### *Correlation Matrix*

The correlation matrix showed positive, statistically significant relationships among most of the variables studied, reflecting the interrelatedness of the value-chain dimensions. Moderate to strong correlations also emerged among some operations, service, and distribution activities, as well as significant relationships between infrastructure and human-resource components. These findings confirm functional integration among the variables. Despite some weak or negative correlations, the majority were positive, supporting the validity of the data for exploratory factor analysis and confirming the existence of latent factors that explain the relationships among the variables.

#### *Determinant*

The determinant value indicates correlations among the variables without severe multicollinearity, suggesting that the variables can be summarised into a limited number of latent factors. The data are therefore suitable for exploratory factor analysis and factor-structure extraction.

### *KMO and Bartlett's Test*

To verify the suitability of the data for exploratory factor analysis, the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test of sphericity were used. The KMO value of .832 exceeds the minimum acceptable threshold of .60, indicating that the sample size is sufficient and that the correlation coefficients among the variables are appropriate for analysis. Bartlett's test was also statistically significant, $\chi^2 = 982.766$, df = 153, $p < .001$, which rejects the null hypothesis and confirms the existence of substantial relationships among the variables. These results indicate that the data are suitable for exploratory factor analysis (EFA).

### Exploratory Factor Analysis

Exploratory factor analysis (EFA) was used to reveal the latent factor structure of the study dimensions. Principal component analysis (PCA) was used primarily for data reduction and the identification of latent factors. Varimax orthogonal rotation was applied to enhance the clarity of the statistical interpretation of the extracted factors. This choice is consistent with the study's objective of verifying scale validity and the construct validity of its dimensions.

### *Quality of Variable Representation*

The communalities indicate that most items had acceptable extraction ratios, ranging from .436 to .897. Items such as Inbound Logistics 1 (.897) and Infrastructure 3 (.802) recorded the highest values, reflecting the strength of their explanation by the extracted factors. By contrast, some items had values below .50, such as Outbound Distribution 4 (.436) and Operations 1 (.462), indicating a relatively weak contribution to shared variance. Items with very weak values were deleted, namely Human Resources 1, Infrastructure 1, Infrastructure 2, Operations 2, Outbound Distribution 1, and Marketing 3. Overall, the values remain within statistically acceptable limits, allowing the analysis to proceed to the explained variance and final factor structure.

### *Explained Variance*

**Table 1**

*Total Variance Explained for the Study Variables*

| Component | Initial Eigenvalues: Total | Initial Eigenvalues: % of Variance | Initial Eigenvalues: Cumulative % | Extraction Sums of Squared Loadings: Total | Extraction Sums of Squared Loadings: % of Variance | Extraction Sums of Squared Loadings: Cumulative % |
|---|---|---|---|---|---|---|
| 1 | 5.668 | 31.138 | 31.138 | 5.668 | 31.138 | 31.138 |
| 2 | 2.063 | 11.332 | 42.470 | 2.063 | 11.332 | 42.470 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | 1.631 | 8.960 | 51.430 | 1.631 | 8.960 | 51.430 |
| 4 | 1.206 | 6.626 | 58.056 | 1.206 | 6.626 | 58.056 |
| 5 | 1.020 | 5.603 | 63.658 | 1.020 | 5.603 | 63.658 |
| 6 | .942 | 5.174 | 68.832 | | | |
| 7 | .798 | 4.383 | 73.216 | | | |
| 8 | .692 | 3.804 | 77.020 | | | |
| 9 | .664 | 3.648 | 80.667 | | | |
| 10 | .602 | 3.308 | 83.975 | | | |
| 11 | .543 | 2.984 | 86.960 | | | |
| 12 | .455 | 2.501 | 89.460 | | | |
| 13 | .419 | 2.304 | 91.765 | | | |
| 14 | .356 | 1.954 | 93.718 | | | |
| 15 | .322 | 1.772 | 95.490 | | | |
| 16 | .312 | 1.714 | 97.204 | | | |
| 17 | .269 | 1.480 | 98.684 | | | |
| 18 | .240 | 1.316 | 100.000 | | | |

*Note.* Source: Asma Djedi, based on SPSS 26 output.

The PCA results show that the eigenvalues indicate the presence of five main factors, each with an eigenvalue greater than 1, in accordance with the Kaiser criterion. Together, these factors explained 63.6% of the total variance in the data, exceeding the minimum accepted threshold in social and behavioural studies, which typically ranges from 50% to 60%. This indicates that the extracted factor model has considerable explanatory power and adequately reflects the latent structure underlying the variables.

The rotation process improved the clarity of the factor structure by redistributing shared variance more evenly across the five factors, making each factor more homogeneous in terms of its associated items. This facilitates interpretation and naming. The extracted model therefore

demonstrates construct consistency, as it simplifies the complex relationships among the variables into five basic, interrelated dimensions.

This result indicates that the phenomenon under study cannot be explained by a single variable or dimension, but rather by five integrated dimensions that constitute the deep structure of the variables. It also confirms the suitability of factor analysis as a statistical tool for extracting these latent dimensions.

***Component Matrix Before Rotation***

**Table 2**

*Component Matrix Before Rotation*

| Item | Component 1 | Component 2 | Component 3 | Component 4 | Component 5 |
|---|---|---|---|---|---|
| Infrastructure 4 | .809 | | | | |
| Operations 4 | .715 | | | | |
| Operations 3 | .717 | | | | |
| Human Resources 2 | .611 | | | | |
| Service 2 | .664 | | | | |
| Outbound Distribution 2 | .636 | | | | |
| Outbound Distribution 3 | .579 | | | | |
| Marketing 4 | .629 | | | | |
| Service 3 | .661 | | | | |
| Service 4 | .649 | | | | |
| Outbound Distribution 4 | .587 | | | | |
| Service 1 | .473 | | | -.406 | |
| Marketing 1 | | .757 | | | |
| Marketing 2 | | .648 | | | |
| Operations 1 | | .481 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Inbound Logistics 1 | | | 1.046 | | |
| Inbound Logistics 1A | | .367 | | .420 | |
| Infrastructure 3 | .611 | | | | .689 |

*Note.* Source: Asma Djedi, based on SPSS 26 output.

The exploratory factor analysis indicated that the items could be reduced to five main factors representing the latent structure of the value chain. The first factor centred on operational efficiency and infrastructure, combining primary and support activities, whereas the second factor was associated with marketing and selected operational aspects. The third factor represented inbound logistics, the fourth organisational infrastructure, and the fifth human-resource management. Overall, these dimensions are consistent with Porter's model, confirming the validity of the results and the capacity of the analysis to reveal sources of value creation within the institution.

***Rotated Component Matrix***

**Table 3**

*Rotated Component Matrix*

| Item | Component 1 | Component 2 | Component 3 | Component 4 | Component 5 |
|---|---|---|---|---|---|
| Service 4 | .821 | | | | |
| Outbound Distribution 3 | .624 | | | | |
| Marketing 4 | .637 | | | | |
| Outbound Distribution 4 | .609 | | | | |
| Human Resources 2 | .503 | | | | |
| Operations 3 | .492 | .483 | | | |
| Service 3 | | .788 | | | |
| Service 2 | | .746 | | | |
| Outbound Distribution 2 | | .640 | | | |

| | | | | | |
|---|---|---|---|---|---|
| Operations 4 | .616 | | | | |
| Marketing 1 | | .918 | | | |
| Marketing 2 | | .578 | | | |
| Service 1 | .410 | .580 | | | |
| Infrastructure 3 | | | .880 | | |
| Infrastructure 4 | .508 | | .788 | | |
| Inbound Logistics 1 | | | | 1.018 | |
| Inbound Logistics 1A | | | | .554 | |
| Operations 1 | | | | | |

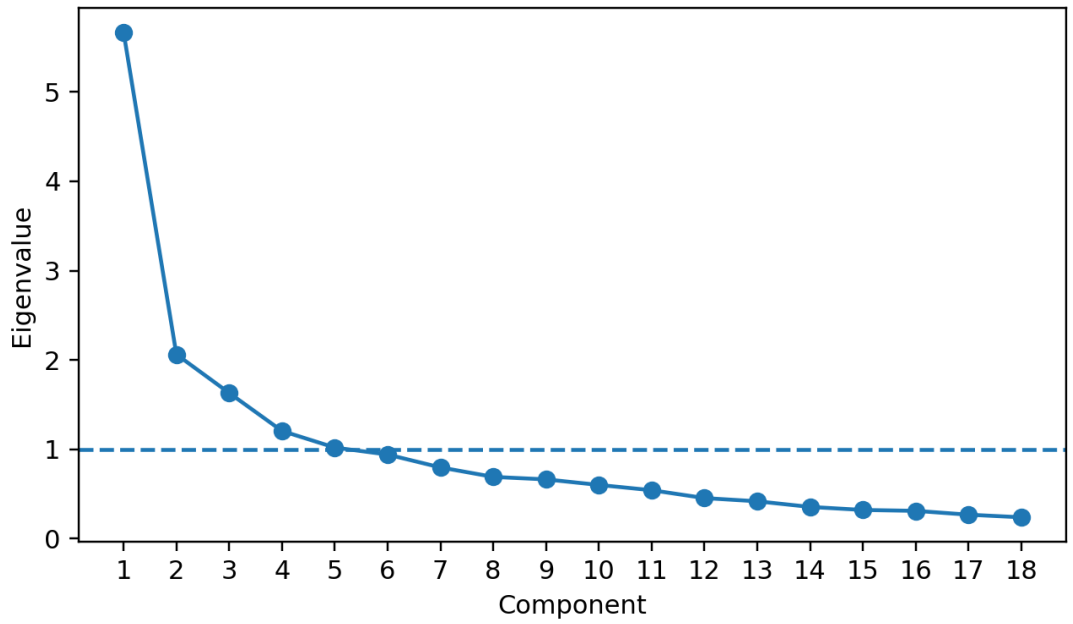
*Note.* Source: Asma Djedi, based on SPSS 26 output.

Principal component analysis was used to extract the factors influencing the study, with Varimax rotation and Kaiser normalisation applied to improve the clarity of the factor structure. The results yielded five main components. The first component included Service 4, Outbound Distribution 3, Marketing 4, Outbound Distribution 4, and Human Resources 2, with loadings ranging from .503 to .821. This component represents activities related to service provision, distribution management, and marketing interaction, and therefore reflects customer value and external services. The second component included Operations 3, Service 3, Service 2, Outbound Distribution 2, Operations 4, and Service 1, with loadings ranging from .410 to .788. This factor reflects internal activities that support operational processes and services, illustrating internal workflow efficiency and the capacity to deliver high-quality services. The third component consisted of Marketing 1 and Marketing 2, with loadings of .918 and .578, respectively, reflecting marketing strategies and activities as a distinct factor. The fourth component consisted of Infrastructure 3 and Infrastructure 4, with loadings of .880 and .788, indicating the physical and infrastructural resources required to ensure operational efficiency. The fifth component consisted of Inbound Logistics 1 and Inbound Logistics 1A, with loadings of 1.018 and .554, respectively, and refers to internal logistics related to receiving and processing resources.

***Scree Plot***

**Figure 1**

*Scree Plot*



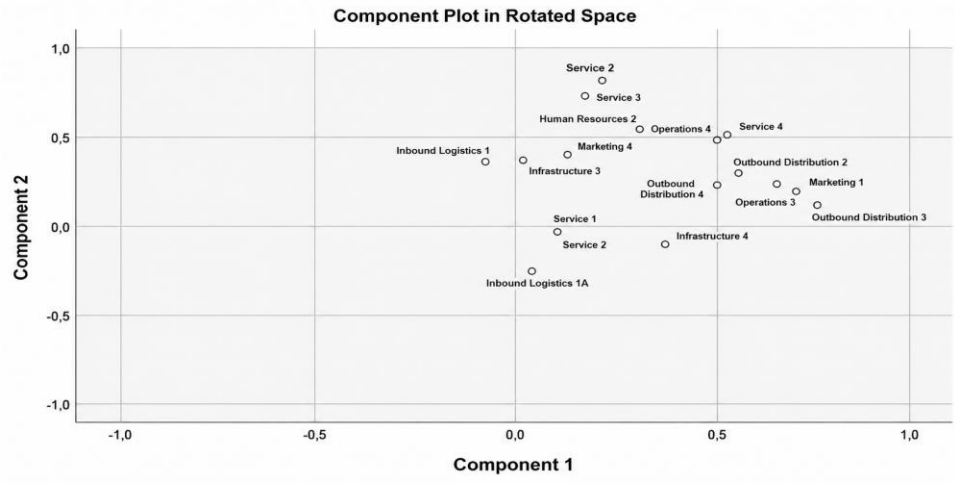

*Note.* Source: Asma Djedi, based on SPSS 26 output.

The scree plot shows that the eigenvalues begin at a high level for the first component (approximately 5.7), then decline sharply at the second component (approximately 2.0), followed by a gradual decrease. The figure indicates that five main components can be retained, as a clear break occurs around the fifth component, whereas subsequent eigenvalues are small and close to 1, adding limited variance. This supports the factor solution reported above.

***Visual Distribution of Variables Across Factors After Rotation***

**Figure 2**

*Visual Distribution of Variables Across the Factors After Rotation*



*Note.* Source: Asma Djedi, based on SPSS 26 output.

The exploratory factor analysis showed that the five extracted dimensions are consistent with Porter's value-chain model (Porter, 1985). The organisational-efficiency dimension reflects infrastructure and support activities, while the service-quality dimension concerns primary activities such as operations and services, highlighting the role of quality in achieving sustainable competitive advantage.

The third dimension, innovation and development, aligns with technological development as one of the support activities in Porter's model, whereas the fourth dimension, human resources and skills, reflects human-resource management as a fundamental pillar supporting the various activities. The fifth dimension, external relations and beneficiary satisfaction, is linked to marketing and sales activities and after-sales service, as these directly enhance beneficiary satisfaction and loyalty.

Thus, the five extracted dimensions are clearly consistent with Porter's value-chain model, strengthening the explanatory power of the results and confirming the institution's effort to balance primary and support activities in support of sustainable competitive advantage.

**Analysis of the Results**

In light of the data analysis and discussion, the study identifies the main dimensions influencing the research topic by interpreting the elements of the value chain from Porter's perspective within the context of Algerian universities. It therefore answers the research question: How does activating the value chain from Porter's perspective in Algerian universities contribute to strengthening digital transformation strategies?

Hypothesis 1: There is a statistically significant relationship between the level of value-chain activation and digital transformation in Algerian universities.

The high item loadings in the five components, such as Service 4 = .821 and Marketing 1 = .918, show the strong effect of these elements on strengthening digital strategies. Factors related to service and distribution, internal operations, marketing, infrastructure, and inbound logistics are therefore strongly associated with universities' capacity for digital transformation.

Hypothesis 1 is therefore supported, as the results indicate a positive and statistically significant relationship between value-chain activation and digital transformation.

Hypothesis 2: The impact of value-chain activation on digital transformation varies according to university characteristics, particularly resources and infrastructure.

The exploratory analysis shows that the fourth component, consisting of Infrastructure 3 = .880 and Infrastructure 4 = .788, and the fifth component, consisting of Inbound Logistics 1 = 1.018 and Inbound Logistics 1A = .554, indicate that universities with stronger infrastructure and resources achieve a greater impact of the value chain on digital transformation. By contrast, universities with limited resources showed lower loadings on some items, such as Operations 3 (.483) and Service 1 (.410), indicating variation in impact across institutional characteristics. On this basis, the value chain is an essential strategic tool for enabling digital transformation in

Algerian universities, although its impact varies according to the level of resources and infrastructure available at each institution.

**Conclusion**

This study highlights the role of activating the value chain, as defined by Porter, in strengthening digital transformation strategies in Algerian universities. The results show a strong positive relationship between the value chain and digital transformation, with service, operations, marketing, and infrastructure making fundamental contributions. They also show that the impact of the value chain varies across universities, particularly in relation to infrastructure and human resources, confirming the role of institutional factors. Finally, the study confirms the importance of operational, physical, and human factors in supporting digital transformation and improving the quality of university services. Based on the field-study results, the following recommendations are proposed:

Develop digital infrastructure and human resources through training in order to improve service efficiency and activate the value chain.

Improve the management of internal operations and services to ensure the rapid and efficient provision of digital services to students and teachers.

Strengthen internal and external marketing and communication activities to deepen awareness of the importance of digital transformation and encourage the adoption of its tools at the university level.

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