

The Impact of Information Technology on the Value Chain of the Higher Education Institution: A Case Study of the University of May 8, 1945 – Guelma

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Abstract:

The study aimed to explore the impact of Information Technology, with its various dimensions, on the value chain at the University of May 8, 1945 – Guelma. The researcher adopted both descriptive and quantitative approaches, using an electronic questionnaire distributed to a random sample of 288 permanent faculty members. Data were analyzed using SPSS and Amos software, and the results revealed a clear positive impact of Information Technology on the value chain, particularly on primary activities. Software-related resources had the strongest influence, followed by data-related resources and communication networks. The findings reflect the university's focus on digitally supporting teaching and scientific research. The study recommends broader digitization of academic and administrative activities. It also suggests transitioning toward a fully integrated digital university model to enhance performance and institutional efficiency.

Keywords: Information Technology; Value Chain; Higher Education Institution; University of May 8, 1945 – Guelma.

Jel Classification Codes : O33 ; L23 ; I23.

I- Introduction:

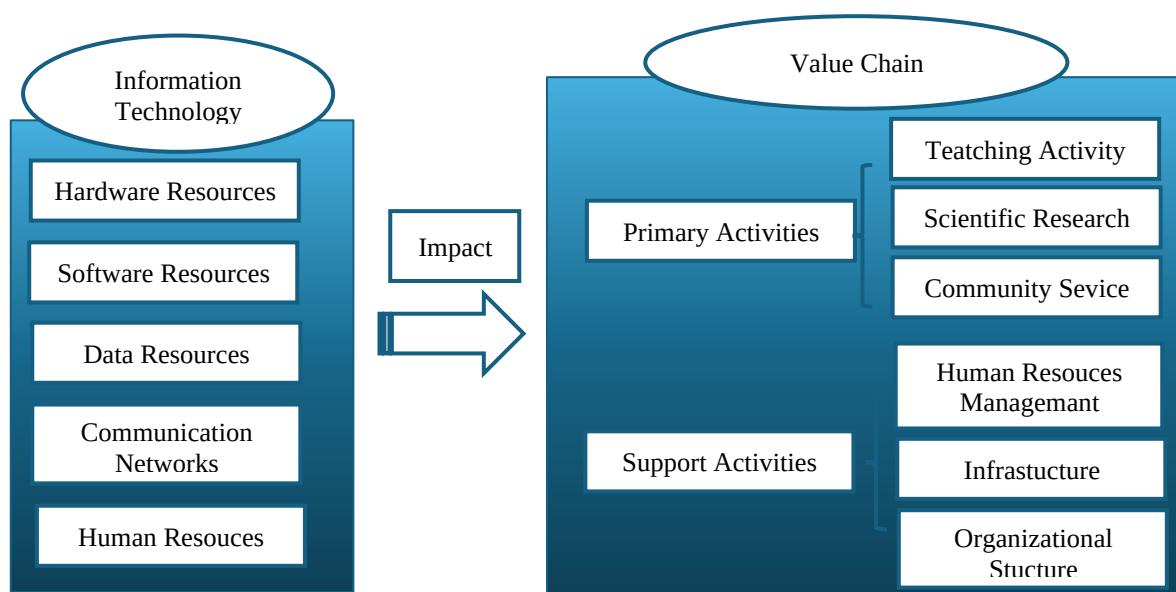
Over the past few decades, Information Technology (IT) has undergone remarkable advancements, leading to a revolution in data processing and fundamental transformations in work patterns and business models. This evolution has been particularly driven by emerging trends such as Artificial Intelligence (AI), the Internet of Things (IoT), and Cloud Computing. With the advent of the 21st century, IT has become a cornerstone of institutional infrastructure—no longer limited to enhancing operational efficiency, it now serves as a strategic enabler of innovation and value creation.

In this context, Michael Porter introduced an analytical framework to understand how value is created through integrated activities within the organization: the Value Chain Model. This model is employed to examine the linkages between primary and support activities. IT has played a pivotal role in enhancing these activities by facilitating the flow of information and strengthening interconnectivity, thereby contributing to waste reduction, improved efficiency, and increased productivity. At the university level, IT has become a critical component in advancing educational and research activities and modernizing administrative processes, with the overarching goal of enhancing the added value generated by these functions. However, such investments can only yield their full potential if effectively leveraged within the academic value chain. Like other institutions worldwide, Algerian universities are striving to keep pace with rapid technological developments by adopting modern digital tools in the hopes of improving the quality of their academic and research outputs and strengthening institutional effectiveness. Among the key digitization initiatives adopted by Algerian universities is the “Sectoral Digitalization Master Plan,” which has led to the implementation of systems such as “Progress” and the “Moodle” platform, among other tools.

Nevertheless, a central issue persists: to what extent are these IT investments truly effective in impacting the university value chain? This gives rise to the main research question of the present study: To what extent does Information Technology influence the value chain of Algerian higher education institutions? And what is the specific case at the University of May 8, 1945 – Guelma?

To address this research question, a conceptual model was developed that categorizes IT into several dimensions: hardware resources, software resources, data, communication networks, and human resources. The university value chain was analyzed through its primary and support activities.

Figure (1): The Hypothetical Model of the Study



Source: Prepared by the researcher.

Based on this framework, two main hypotheses were formulated: The first hypothesis posits that IT has a significant impact on the value chain of the University of May 8, 1945 – Guelma, at a 5% significance level. This hypothesis is further broken down into sub-hypotheses addressing the influence of each IT dimension. The second hypothesis suggests that there are statistically significant differences in the impact of IT between primary and support activities, also subdivided into two specific sub-hypotheses.

This study is of particular importance as it is among the first to explore the relationship between IT and the value chain in Algerian universities, a topic rarely addressed in local academic literature despite the national trend toward digital transformation. The study contributes to the body of knowledge by providing scientific insights that can inform digital policy development and enhance university performance in a more integrated and effective manner.

The study aims to assess the current state of IT and the value chain at the University of May 8, 1945 – Guelma, analyze the impact of IT on various dimensions of the value chain, and identify the most influential dimensions. It also seeks to compare the impact of IT on primary versus support activities and to propose practical recommendations for improving IT efficiency within the university in a way that enhances performance and the quality of academic and administrative outcomes.

The study is organized into two main parts: the first presents the theoretical framework, including core concepts related to IT and the value chain; the second is dedicated to the empirical investigation, which analyzes the impact of IT on the value chain at the University of May 8, 1945 – Guelma, through the presentation and discussion of results, followed by relevant recommendations.

II-The theoretical framework of the study:

This section aims to present the conceptual and operational definitions of the key terms used in the study, with a focus on the theoretical and practical aspects that contribute to building a comprehensive scientific model for examining the impact of Information Technology on the university's value chain.

1. Information Technology :

Information Technology (IT) is considered one of the core concepts in the modern business environment, as it has become the backbone of both administrative and operational activities within organizations. Scholars have approached this concept from various disciplinary backgrounds and perspectives, resulting in a set of complementary definitions that highlight the multifaceted nature of IT.

From a holistic perspective, (Fahmi Ibrahim, 2020) defines Information Technology as a collection of resources and techniques employed to collect, store, process, and transmit information within an organization. This facilitates communication, supports decision-making, and contributes to gaining a competitive advantage. He also emphasizes that IT is a fundamental element of modern organizational structures due to its critical role in enhancing administrative efficiency and effectiveness.

From a technical standpoint, Efraim Turban describes IT as comprising hardware components, software, networks, and databases that work together in an integrated manner to store, modify, retrieve, and provide data and information to support various managerial levels. This definition underscores the technological infrastructure—both hardware and software—that underpins IT systems (Aldhmour, 2019).

In the context of higher education, IT is defined as the systematic and strategic application of methods and techniques derived from behavioral and natural sciences to analyze and improve the university education process. This is achieved through the use of Information and Communication Technologies (ICT) to support teaching, enhance the learning experience, foster interaction between

faculty and students, and improve both academic and administrative performance within the university setting (Gökalp, 2010).

Researchers differ in identifying the core components of Information Technology, with relative variations across studies. The following table compares three prominent studies to illustrate the extent of consensus or divergence regarding the constituent elements of IT:

Table (1): Components of Information Technology

Source	Hardware Resources	Software Resources	Data Resources	Communication Networks	Human Resources
(Aldjia, 2023)	✓	✓		✓	
(Fatiha, 2021)	✓	✓	✓	✓	
(Sahanine, 2017)	✓	✓	✓	✓	✓
(AlSamawi, 2016)	✓	✓	✓	✓	

Source: Prepared by the researcher based on the references listed in the table.

It is evident from the table that there is general agreement among the researchers (Aldjia, 2023), (Fatiha, 2021) and (AlSamawi, 2016) regarding the importance of hardware and software components, as these were consistently included in their studies. The role of data and communication networks in supporting the IT system was also confirmed. However, (Sahanine, 2017) was the only researcher to explicitly include the human element as an integral part of the infrastructure. Based on this framework, the following sections will elaborate on each of these components under the theme "IT Infrastructure," noting that these dimensions will also be adopted in the empirical section of the study.

- **Hardware Resources:** These refer to the tangible, physical components of IT, such as computers, servers, storage units, input, and output devices. Their importance lies in providing the foundational infrastructure needed to operate information systems and perform various technical tasks efficiently (Huimin, 2017).
- **Software Resources:** This refers to a set of commands and instructions written in programming languages, designed to operate hardware and perform specific tasks like processing, storage, and control. Software serves as the intermediary that transforms hardware capabilities into organized and purposeful performance (Huimin, 2017).
- **Data Resources:** These include raw data that is recorded and stored before being processed into useful information for decision-making (Kaakaa, 2020). When such data is organized and compiled into business files, it forms what is known as a database (Ghorishi, 2011).
- **Network Infrastructure:** These are the technological structures that connect various devices to enable data and information exchange either locally or globally. They serve as the communication medium that enables system integration and extends the scope of technical operations (Huimin, 2017).
- **Human Resources:** This includes individuals with the technical and cognitive skills required to plan, implement, operate, and maintain information systems. It comprises system engineers, software developers, business analysts, project managers, and end-users who interact with these systems (Jahangir Karimi, 2001).

2. Value Chain:

In recent decades, the higher education sector has witnessed growing interest in the concept of "value," in light of the global shift toward investing in human capital—one of the fundamental strategic assets for building modern societies. Higher education is no longer confined to the delivery of traditional academic knowledge; rather, it has become a key instrument for generating added value at both individual and societal levels. The development of individuals' intellectual and cognitive skills through higher education systems is among the most critical means of achieving sustainable development, especially as educated individuals represent the backbone of a knowledge-based economy driven by creativity and innovation.

Within this framework, "value" in higher education is viewed as the actual progress made by students throughout their academic journey, reflected in the acquisition of knowledge, the development of skills, and engagement in societal activities. Graduation is no longer merely about obtaining a certificate; it signifies the attainment of added value manifested in intellectual competence, problem-solving abilities, and a positive impact on the social and economic environment. According to (Al-Munim, 2022), the value of higher education stems from the academic and practical experiences students undergo during their studies.

To understand how such value is created within universities, the concept of the "value chain" has emerged as an analytical framework that outlines the sequence of activities that generate value for both students and society. In this context, Sison and Pablo argue that the higher education value chain is composed of an integrated network of activities centered around teaching, research, and community service. It also encompasses curriculum design, program delivery and evaluation, and community engagement. These core activities are supported by ancillary functions such as admissions and enrollment, registration services, and alumni support, all of which contribute to a comprehensive educational package (Allah, 2019). (Ensign, 2001). further emphasizes that the value chain offers universities an effective tool for strategic planning and analytical assessment of value-generating activities.

Along the same lines, Merwe and Cronje conceptualize the value chain as a framework used to analyze both primary and support activities within the university, focusing on the strategic deployment of Information Technology to enhance educational quality, improve operational efficiency, and provide effective institutional services. This includes student management, academic content development, faculty support, and the provision of advanced technological infrastructure (Rupa Rathee, 2013).

In another perspective, (Urvashi Makkar, 2008) proposed a participatory model of the university value chain that highlights collaboration and integration among various stakeholders in the educational process, including investors, academic staff, administrators, and students. This model integrates the core elements of the educational process—such as academic program design, institutional accreditation, and the learning experience—with support functions including infrastructure, information systems, and qualified human resources, with the objective of creating an interactive learning environment that ensures quality and excellence in higher education outcomes.

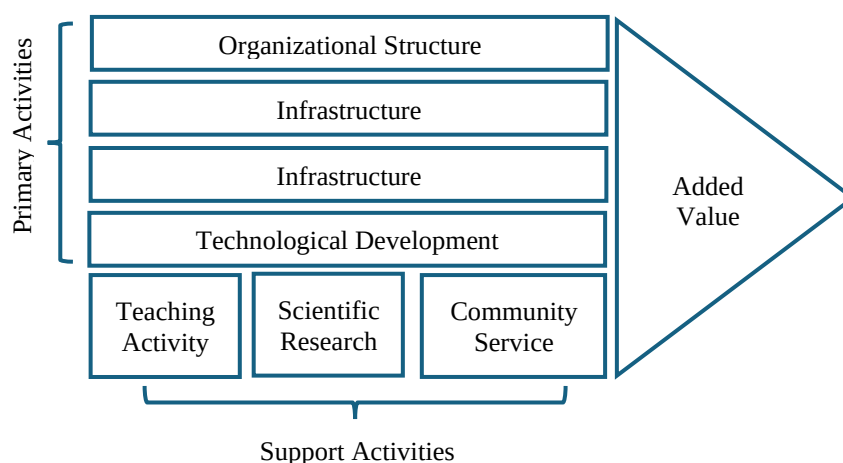
A simplified understanding of the university value chain can be drawn from the model by (Pathak, 2010), which defines it as an integrated framework that organizes primary activities—

namely teaching, research, and community service—alongside support activities including infrastructure, human resources, and technology. This model aims to transform students into qualified graduates through technologically supported teaching and research processes, thereby achieving high levels of institutional quality and competitiveness.

At the Arab world level, Yemeni researcher Ittihad Mohammed Arshan, in collaboration with Nabil Ahmed Al-Afiri (2020), introduced an Arab model for analyzing the university value chain. Their framework draws on the works of Pablo & Sison (2000) and Hutaibat (2011), and classifies the value chain into core activities such as teaching (involving students, faculty members, programs, and courses), scientific research (supporting development and offering scientific and societal solutions), and community service (through program marketing, linking universities with the labor market, and strengthening partnerships with the private sector).

The support activities in this model include organizational infrastructure (e.g., administration, planning, legal affairs), human resources (focusing on the development of academic and administrative competencies), infrastructure (such as laboratories, libraries, and classrooms), and technological development (which enhances teaching methods and facilitates university services). The added value is generated through the interaction between these activities, which is reflected in the quality of graduates, the effectiveness of scientific research, the efficiency of administrative performance, the readiness of human capital, and the creation of an educational environment conducive to innovation (Nabil Ahmed Al-Afeeri, 2020).

Figure (2): University Value Chain Model



Source: (Nabil Ahmed Al-Afeeri, 2020).

It becomes clear, therefore, that the value chain within a university serves as both an analytical and strategic tool that contributes to understanding how value is created and developed inside the institution. This is achieved through the integration of academic and support activities, the strategic use of modern technologies, and the establishment of effective partnerships within and beyond the educational environment.

III-The applied framework of the study

The University of May 8, 1945 – Guelma is one of the emerging higher education institutions in Algeria, having witnessed notable development in its infrastructure, academic programs, and adoption of digital systems. It was selected as the field of application for this study due to its involvement in digital transformation initiatives, such as the "Progress" system and the "Moodle" platform, making it a suitable model for analyzing the impact of Information Technology on the university value chain, including both primary and support activities.

1. The Study Instrument:

The study was conducted using an online questionnaire as the primary research instrument. The questionnaire was divided into two main sections: the first section addressed the demographic characteristics of the sample, while the second section focused on the study variables, namely Information Technology and the university's value chain.

Table (2): Questionnaire Details by Variables and Items

Section		Variables	Items
Part One		Personal and Job-related Information	5
Part Two	Independent Variable: Information Technology	Hardware Resources	3
		Software Resources	5
		Data Resources	5
		Communication Networks	4
		Human Resources (IT Personnel)	5
	Dependent Variable: Value Chain	Teaching	10
		Scientific Research	7
		Community Service	8
		Human Resources Management	4
		Infrastructure	6
		Organizational Structure	5

Source: Prepared by the researcher.

2. Study Population and Sample:

The study population consists of the permanent faculty members at the University of 8 May 1945 in Guelma, totaling 1,009 professors. Due to the difficulty of covering the entire population, the Krejcie and Morgan formula was used to determine an appropriate sample size. Accordingly, a random sample of 288 permanent professors was selected.

3. Study Methodology:

The descriptive-analytical approach was adopted in the theoretical part of the study, with the aim of reviewing and analyzing the fundamental concepts and theoretical models related to the research topic. In the applied part, the quantitative approach was employed to measure the impact of information technology on the value chain, through the use of an electronic questionnaire and the application of appropriate statistical analysis methods.

4. Validity of the Study Instrument:

The study relied on face validity, which was ensured through expert judgment. Before distributing the questionnaire to the target sample, it was reviewed by the academic supervisor and several experienced faculty members specialized in the field. Based on their feedback, modifications were made to the questionnaire, which contributed to enhancing its credibility.

Additionally, internal consistency validity of the questionnaire dimensions was assessed by calculating Pearson correlation coefficients between each sub-dimension and the total score of the corresponding construct. This helps ensure that the sub-dimensions are well-aligned with the main construct.

Table (3): Pearson Correlation Coefficients Between Sub-Dimensions and the Total Score of Each Construct

Construct	Dimension	Correlation Coefficient	Construct	Dimension	Correlation Coefficient
Information Technology	Hardware Resources	0.621	Value Chain	Teaching	0.794
	Software Resources	0.82		Scientific Research	0.846
	Data Resources	0.812		Community Service	0.81
	Communication Networks	0.735		HR Management	0.819
	Human Resources	0.811		Infrastructure	0.796
	/	/		Organizational Structure	0.844

Source: Prepared by the researcher based on SPSS V.20 outputs.

Based on the table results, it is evident that all correlations are statistically significant ($r > 0.3$), indicating internal consistency between each dimension and its corresponding construct. This suggests that the dimensions effectively contribute to the accurate measurement of the study variables.

5. Reliability of the Study Instrument:

The results were as follows:

Table (4): Questionnaire Reliability Test

Axis	Dimensions	Number of Items	Cronbach's Alpha
Information Technology	Hardware Resources	3	0,89
	Software Resources	5	0,785
	Data Resources	5	0,814
	Communication Networks	4	0,879
	Human Resources	5	0,869
Value Chain	Teaching	10	0,799
	Scientific Research	7	0,726
	Community Service	8	0,923
	Human Resources Management	4	0,843
	Infrastructure	6	0,814
	Organizational Structure	5	0,877
Overall Questionnaire		62	0,964

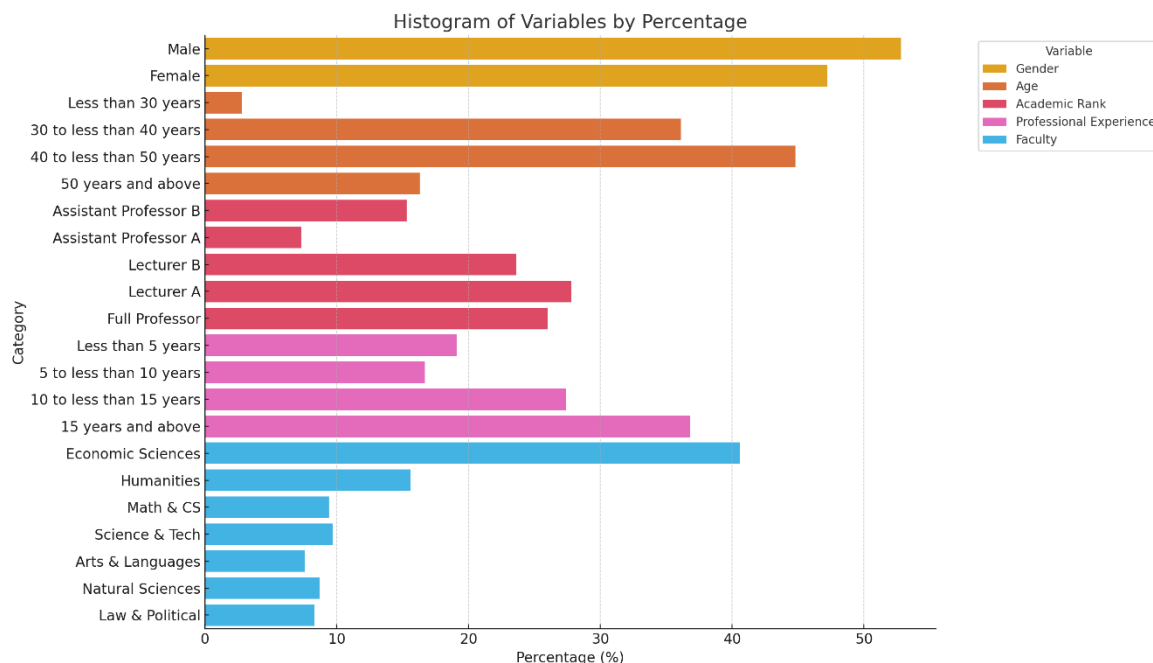
Source: Prepared by the researcher based on SPSS V.20 output.

Based on the table, the total Cronbach's Alpha reached a value of 0.964, indicating a high level of instrument reliability. Therefore, the questionnaire can be considered stable and consistent, and the results derived from it can be relied upon to support the objectives of the study.

6. Demographic Distribution of the Study Sample:

In order to extract meaningful results from the data provided by the study sample, descriptive statistical methods were employed, specifically frequencies and percentages. These measures allow for a clear representation of the demographic and professional characteristics of the respondents, which contributes to a better understanding of the study context.

Figure (3): Distribution of the Study Sample by Demographic and Professional Variables



Source: Prepared by the researcher based on SPSS V.20 outputs.

The demographic data of the study sample indicates notable diversity and inclusiveness in participants' characteristics, enhancing the credibility and accuracy of the results.

In terms of gender, the sample was fairly balanced between males (52.8%) and females (47.2%), minimizing any potential gender bias.

Regarding age, the dominant group was between 40 and under 50 years (44.8%), followed by those aged 30 to under 40 years (36.1%), reflecting a strong presence of active and experienced academics.

As for academic rank, the highest proportions were "Senior Lecturer A" (27.8%) and "Full Professor" (26%), indicating a sample rich in senior academic expertise.

Professional experience data showed that most participants had more than 15 years of experience (36.8%), followed by those with 10 to under 15 years (27.4%), confirming the academic weight of the sample.

In terms of faculty affiliation, the Faculty of Economics, Business, and Management Sciences had the highest representation (40.6%), with varying representation from other faculties, reflecting a richness and diversity in academic specializations.

Based on this, the diverse composition of the sample in terms of gender, age, academic rank, experience, and institutional affiliation provides a strong foundation for comprehensive and reliable scientific analysis, capable of producing results that are generalizable to the study population at the University of Guelma.

7. Analysis and Interpretation of Results :

For the analysis of the questionnaire's axes, we relied on the following five-point Likert scale:

Table (5): Five-Point Likert Scale

Rating Category	1	2	3	4	5
Descriptive Rating	Very Low	Low	Moderate	High	Very High
Mean Score Range	1.00 - 1.80	1.81 - 2.60	2.61 - 3.40	3.41 - 4.20	4.21 - 5.00

Source: (Charfi, 2023).

7.1. Analysis of the Information Technology Axis:

The results were as follows:

Table (6): Study Sample's Attitudes Toward IT Dimensions

Dimension	Mean	Std. Dev.	Level	Rank
Hardware Resources	3.08	0.74	Moderate	3
Software Resources	3.28	0.67	Moderate	1
Data Resources	3.19	0.69	Moderate	2
Communication Networks	2.42	0.88	Low	5
Human Resources	2.57	0.79	Low	4
IT Axis	2.92	0.58	Moderate	/

Source: Prepared by the researcher based on SPSS V.20 outputs.

Table 6 shows that the overall assessment of IT dimensions at the university by the respondents was of a moderate level, with a mean of 2.92. The relatively low standard deviation (0.58) indicates a reasonable degree of consensus among participants.

The highest-rated dimension was Software Resources (mean = 3.28), reflecting relative satisfaction with the availability of software and its role in supporting academic work. This was followed by Data Resources (mean = 3.19), indicating effective database performance. Hardware Resources came third with a moderate rating (mean = 3.08).

On the other hand, Human Resources scored low (mean = 2.57), indicating a lack of specialized personnel support. Communication Networks ranked last with a mean of 2.42, pointing to weak network infrastructure.

7.2. Analysis of the Value Chain Axis:

The results were as follows:

Table (7): Study Sample's Attitudes Toward Value Chain Dimensions

Value Chain Dimensions		Mean	Std.Deviation	Trend	Rank
Primary Activities	Teaching	3.61	0.53	High	1
	Scientific Research	3.19	0.58	Moderate	2
	Community Service	2.83	0.79	Moderate	3
Average of Primary Activities		3.24	0.53	Moderate	/

Support Activities	Human Resource Management	3.22	0.85	Moderate	2
	Infrastructure	2.86	0.76	Moderate	3
	Organizational Structure	3.36	0.83	Moderate	1
Average of Support Activities		3.12	0.71	Moderate	/
Overall Value Chain Dimension		3.2	1.13	Moderate	/

Source: Prepared by the researcher based on SPSS V.20 outputs.

Table 7 reveals that the average assessment of the value chain dimensions at the University of 8 May 1945 – Guelma stood at 3.20, placing it within the "moderate" category according to the Likert scale. The dimension of primary activities recorded a mean score of 3.24. Within this category, teaching activity ranked highest with a relatively elevated mean of 3.61, indicating respondents' satisfaction with the quality and effectiveness of the academic programs delivered. Scientific research followed, with a mean score of 3.19, reflecting a moderate institutional emphasis on this core academic function. Conversely, community service ranked lowest, scoring an average of 2.83, underscoring the need to reinforce the university's role and outreach in serving the wider community.

With regard to supporting activities, the overall mean was 3.12. The organizational structure dimension achieved the highest mean (3.36), suggesting clarity in the delineation of roles and responsibilities, as well as the presence of effective internal communication channels. Human resource management came next, with a mean of 3.22, indicating a satisfactory perception of recruitment, development, and evaluation mechanisms. Meanwhile, infrastructure received the lowest score among supporting activities, with a mean of 2.86, pointing to a perceived deficiency in physical facilities and essential support services, and highlighting an area in urgent need of development.

Overall, the findings suggest a moderate level of consensus among faculty members regarding the implementation and performance of the university's value chain components. However, the relatively low scores in critical areas such as infrastructure and community service suggest the need for strategic reinforcement to enhance institutional integration, operational coherence, and ultimately, organizational effectiveness.

8. Hypothesis Testing of the Study :

Before testing the hypotheses, the distribution of the study data was examined, and the results were as follows:

Table (8): Normality Test Results

	Kolmogorov-Smirnov ^a		
	Df	Statistic	Sig
Information Technology	288	0.041	0.200*
Value Chain	288	0.033	0.200*

Source: Prepared by the researcher based on SPSS V.20 outputs.

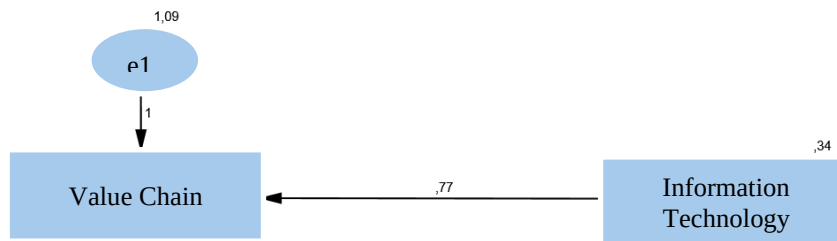
As shown in the table above, the significance (Sig) values for the study variables are greater than the 0.05 significance level, indicating that the data follow a normal distribution.

8.1. Testing the First Main Hypothesis:

Alternative Hypothesis (H₁): There is a statistically significant effect of Information Technology on the Value Chain of the University of 8 May 1945 – Guelma at a significance level of 5%.

Null Hypothesis (H₀): There is no statistically significant effect of Information Technology on the Value Chain of the University of 8 May 1945 – Guelma at a significance level of 5%.

Figure (4): Structural Model of the Effect of Information Technology on the Value Chain



Source: Prepared by the researcher based on AMOS V.24 outputs.

The structural model illustrating the effect of Information Technology on the Value Chain demonstrates a direct relationship between the independent variable (Information Technology) and the dependent variable (Value Chain). However, confirming this relationship requires a detailed analysis of statistical indicators, such as regression weights, standard error, and significance level, which are presented in the table below to clarify the strength and relevance of this effect.

Table (9): Statistical Analysis of the Effect of Information Technology on the Value Chain

Independent Variable	Path	Dependent Variable	Estimate	S.E	C.R	P
Information Technology	-->	Value Chain	0.775	0.106	7.307	***

Source: Prepared by the researcher based on AMOS V.24 outputs.

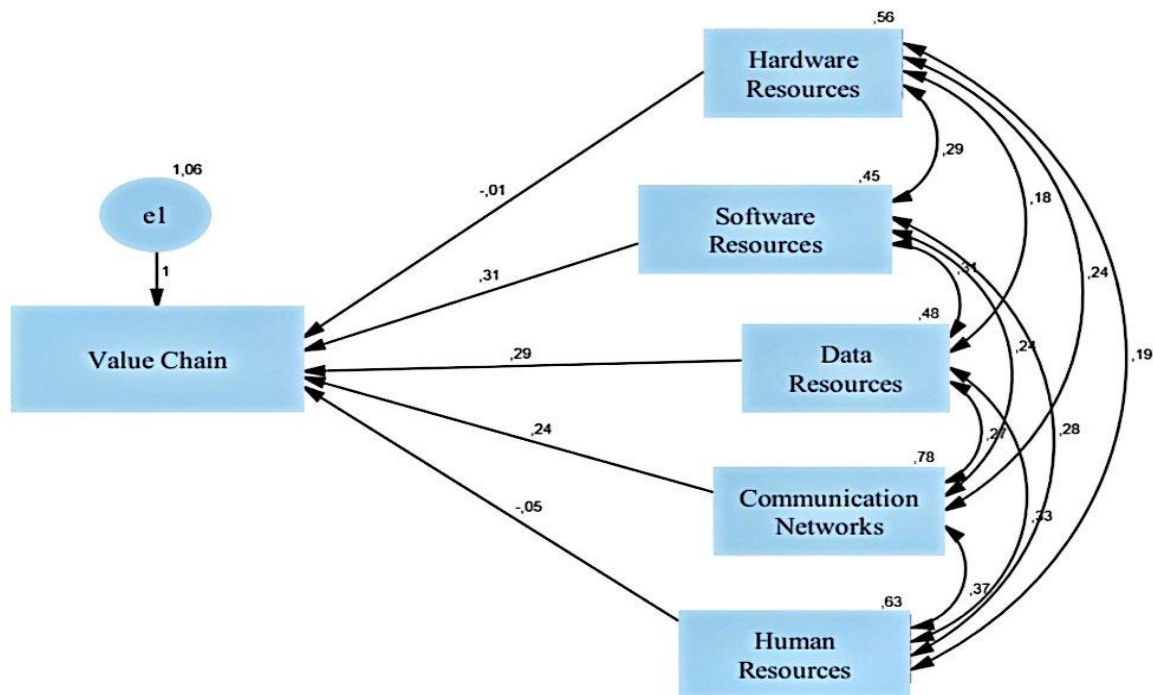
Table 9, based on structural equation modeling (SEM) using AMOS V.24, shows that Information Technology has a strong and positive impact on the Value Chain at the University of 8 May 1945 – Guelma. The estimated coefficient of 0.775 indicates that improved utilization of Information Technology significantly contributes to the enhancement of the Value Chain. The low standard error (0.106) reflects the precision of the estimate. Moreover, the critical ratio (C.R.) of 7.307 exceeds the threshold value of 1.96, confirming the statistical significance of the relationship. The p-value ($P < 0.001$) further supports the existence of a statistically significant effect.

Accordingly, the alternative hypothesis, which posits a significant effect of Information Technology on the Value Chain, is accepted. The null hypothesis is rejected, thereby reinforcing the reliability of the study's findings.

▪ **Sub-Hypotheses Translation:**

The sub-hypotheses state that there is a statistically significant impact of the dimensions of Information Technology (hardware resources, software-related resources, data-related resources, communication networks, and human resources) on the value chain at the University of 8 May 1945 Guelma at a 5% significance level.

Figure (5): Structural Equation Modeling (SEM) of the Impact of IT Dimensions on the Value Chain



Source: Prepared by the researcher based on AMOS V.24 output.

The above figure illustrates the Structural Equation Modeling (SEM) of the impact of IT dimensions on the value chain. It reveals the existence of a significant influence of hardware resources, data-related resources, and communication networks on the value chain. To verify the accuracy of these estimates and the model's validity, it is necessary to calculate the goodness-of-fit indicators, which are presented in the following table:

Table (10): Statistical Analysis of the Impact of IT Dimensions on the Value Chain

Independent Variable Dimension	Path	Dependent Variable	Estimate	S.E	C.R	P
Hardware Resources	----->	Value Chain	-0.010	0.102	-0.099	0.921
Software Resources	----->	Value Chain	0.311	0.141	2.213	0.027
Data Resources	----->	Value Chain	0.290	0.126	2.291	0.022
Communication Networks	----->	Value Chain	0.237	0.085	2.785	0.005
Human Resources	----->	Value Chain	0.053	0.104	-0.509	0.610

Source: Prepared by the researcher based on AMOS V.24 output.

The statistical analysis of the impact of IT dimensions on the value chain at the University of 8 May 1945 Guelma showed varying results. The structural equation modeling demonstrated that some dimensions have a significant and positive effect, while others did not prove to be effective. Software-related resources exhibited a strong and significant influence on the value chain with an estimate of 0.311 ($P = 0.027$). Similarly, data-related resources showed a significant impact with an estimate of 0.290 ($P = 0.022$), as did communication networks with a positive effect at a significance level of 0.237 ($P = 0.005$). On the other hand, hardware resources and human resources did not show a statistically significant effect, with high P-values ($P > 0.05$), indicating no statistically significant relationship with the value chain.

Accordingly, the alternative hypotheses related to software, data, and communication networks are accepted, while the hypotheses concerning hardware and human resources are rejected. These results suggest that the effectiveness of the university's value chain relies more heavily on

software, data, and communication networks than on physical or human aspects. This highlights the importance of focusing on the development of these technical dimensions to enhance institutional performance.

▪ **Modeling the Impact of Information Technology on the Value Chain Using a Statistical Equation:**

The impact of Information Technology on the value chain at the University of May 8, 1945 – Guelma was modeled using a statistical equation, based on multiple regression analysis performed with SPSS V.20 software. This model aims to clarify the effect of the various dimensions of Information Technology (hardware resources, software-related resources, data-related resources, communication networks, and human resources) on the dependent variable, which is the value chain.

Table (11): Results of the Multiple Regression Test for the Impact of Information Technology on the Value Chain

Model	Unstandardized Coefficients	Standardized Coefficients (Beta)		T	Sig.
	B	Std. Error	Beta		
(Constant)	0.853	0.343	/	2.487	0.013
Hardware Resources (X1)	-0.01	0.103	-0.007	-0.098	0.922
Software Resources (X2)	0.311	0.142	0.184	2.194	0.029
Data Resources (X3)	0.29	0.128	0.178	2.271	0.024
Communication Networks (X4)	0.237	0.086	0.184	2.761	0.006
Human Resources (X5)	-0.053	0.105	-0.037	-0.505	0.614

Source: Prepared by the researcher based on SPSS V.20 output.

Based on statistically significant values, the equation modeling the impact of Information Technology on the value chain can be formulated as follows:

$$Y = 0.311X_2 + 0.290X_3 + 0.237X_4 + 0.853$$

From this equation, we can derive the following insights:

- An increase of one unit in software-related resources (X₂) results in an increase of 0.311 units in the value chain, assuming other variables remain constant.
- An increase of one unit in data-related resources (X₃) leads to an increase of 0.290 units in the value chain, all else being equal.
- An increase of one unit in communication networks (X₄) leads to a 0.237 unit increase in the value chain, holding other factors constant.

This indicates that the strongest impact on the value chain comes from software-related resources, followed by data-related resources, and then communication networks.

8.2. Testing the Second Main Hypothesis:

Following the confirmation of the impact of Information Technology (IT) on the value chain of the University of 8 May 1945 Guelma, the analysis proceeds to determine whether IT exerts a greater influence on primary activities compared to support activities.

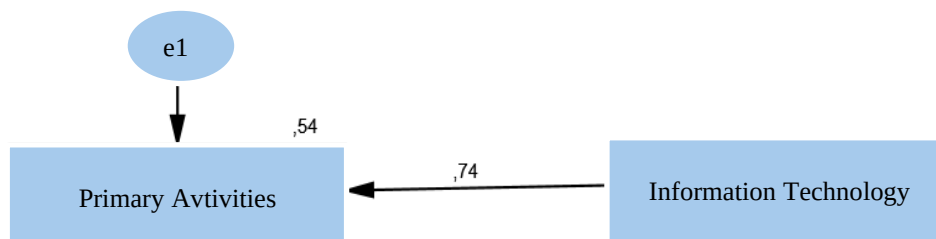
Alternative Hypothesis (H₁): There are statistically significant differences in the impact of Information Technology between primary and support activities at the University of 8 May 1945 Guelma.

Null Hypothesis (H₀): There are no statistically significant differences in the impact of Information Technology between primary and support activities at the University of 8 May 1945 Guelma.

- **Testing the Impact of Information Technology on Primary Activities:**

The test results are as follows:

Figure (6): Structural Model of the Impact of Information Technology on Primary Activities



Source: Developed by the researcher based on AMOS V.22 outputs.

The structural model demonstrates a direct relationship between Information Technology and primary activities. However, confirming the strength and significance of this relationship requires a precise analysis of key statistical indicators such as standardized regression weights, standard error, and significance level, which are detailed in the table below:

Table (12): Statistical Analysis of the Impact of Information Technology on Primary Activities

Independent Variable	Path	Dependent Variable	Estimate	S.E	C.R	P
Information Technology	-->	Primary Activities	0.738	0.018	18.528	***

Source: Developed by the researcher based on AMOS V.22 outputs.

Table 12 clearly indicates that Information Technology has a strong and positive impact on the primary activities at the University of 8 May 1945 Guelma, with a standardized estimate of 0.738. This value reflects that the enhancement of IT utilization significantly improves the effectiveness of core academic functions, including teaching, scientific research, and community engagement.

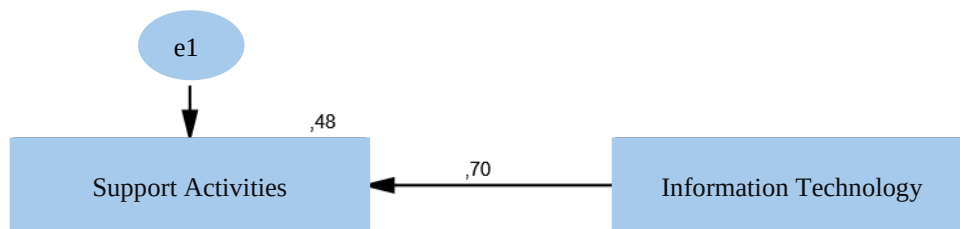
Furthermore, the standard error of 0.018 is remarkably low, suggesting high estimation precision. The critical ratio (C.R. = 18.528) far exceeds the threshold of 1.96, confirming the statistical significance of the effect. Additionally, the p-value ($P < 0.001$) indicates a highly significant relationship.

Accordingly, the results of the structural model provide robust support for the acceptance of the alternative hypothesis, confirming a substantial and statistically significant effect of Information Technology on primary activities. The findings also reflect a high degree of reliability in the statistical analysis.

▪ Testing the Impact of Information Technology on Support Activities:

The test results are as follows:

Figure (7): Structural Model of the Impact of Information Technology on Support Activities



Source: Developed by the researcher based on AMOS V.22 outputs.

The structural model illustrates a direct relationship between Information Technology and support activities. However, confirming the validity and strength of this relationship requires a rigorous examination of statistical indicators such as standardized regression weights, standard error,

and significance level. These are presented in the following table to clarify the magnitude and significance of the effect.

Table (13): Statistical Analysis of the Impact of Information Technology on Support Activities

Independent Variable	Path	Dependent Variable	Estimate	S.E	C.R	P
Information Technology	-->	Support Activities	0.696	0.026	16.435	***

Source: Developed by the researcher based on AMOS V.22 outputs.

Table 13 shows that Information Technology has a positive and substantial effect on the support activities at the University of 8 May 1945 Guelma, with a standardized estimate of 0.696, indicating a strong relationship. The standard error is 0.026, which is relatively low and reflects high precision in the estimate. The critical ratio (C.R. = 16.435) significantly exceeds the statistical threshold of 1.96, confirming the significance of the relationship. Additionally, the p-value is well below 0.05, further validating the robustness of the result.

These findings suggest that the integration of Information Technology contributes significantly to enhancing the university's infrastructure, human resources, and organizational structure. However, it is noteworthy that the impact on primary activities (0.738) is stronger than that on support activities (0.696), supporting the rejection of the null hypothesis and the acceptance of the alternative hypothesis.

IV-Conclusion :

In light of the field study and statistical analyses conducted, a set of final findings has been derived that reflect the actual relationship between Information Technology (IT) and the value chain at the University of 8 May 1945 Guelma. These results aimed to clarify the extent to which the components of IT influence the university's value chain, both at the level of primary and support activities. The key findings are summarized as follows:

- The overall availability and effectiveness of IT at the university is assessed as moderate, with noticeable disparities between areas of strength and weakness, highlighting the need to enhance digital readiness and integration.
- Primary activities received an average evaluation, reflecting an acceptable performance in areas such as teaching, scientific research, and community service, while also indicating the need for targeted improvements to achieve higher quality standards.
- Support activities showed a moderate level of alignment, particularly in the organizational structure and human resources management, whereas infrastructural aspects exhibited relative shortcomings that require enhancement.
- The overall assessment of the university's value chain fell within the medium range, suggesting a need to improve operational efficiency and the integration of various dimensions to elevate institutional performance.
- Statistical analysis revealed a strong and positive impact of IT on the value chain (Standardized Estimate = 0.775), accounting for approximately 60% of the observed variance.
- The most influential IT dimensions were software resources, data management, and communication networks, all of which demonstrated high effectiveness and statistical significance.
- In contrast, physical resources and human resources did not show a statistically significant impact, indicating that they are not decisive factors in enhancing the university's value chain.
- Among all dimensions, software resources emerged as the most critical factor in supporting and strengthening the university's value chain.

- IT exerted a stronger impact on primary activities than on support activities, reflecting the university's emphasis on reinforcing academic over administrative functions.
- The relatively weaker impact on support activities reveals a gap in administrative and service digitization, which must be addressed to achieve comprehensive digital integration.

Based on these findings, the study proposes the following recommendations:

- Enhance the IT infrastructure: Invest in the modernization and maintenance of physical resources (servers, computers, and networks) to ensure a reliable and supportive technological environment for university operations.
- Develop integrated enterprise software systems: Adopt comprehensive information systems (e.g., ERP, LMS, CRM) that enable seamless connectivity among university departments and facilitate the flow of data between primary and support activities.
- Establish accurate and integrated databases: Improve the quality of available data and implement effective mechanisms for regular updating and analysis, thereby supporting informed decision-making across academic and administrative levels.
- Strengthen internal and external communication networks: Expand high-speed networking across university faculties and facilities, while ensuring access to both local and international digital knowledge resources.
- Enhance human capital in the digital domain: Provide specialized IT training programs for faculty and administrative staff to improve digital literacy and ensure the effective use of available technological systems.
- Prioritize digital transformation in support activities: Digitize administrative, financial, and student service processes to reduce the existing gap between primary and support activities and promote overall institutional integration.
- Adopt a comprehensive digital strategy: Develop a long-term strategic plan aimed at full digital transformation, with clearly defined implementation priorities, performance indicators, and regular evaluation mechanisms.
- Promote a culture of innovation and digital transformation: Encourage academic and administrative units to embrace technological initiatives and recognize outstanding efforts in the digitization of education and university services.
- Focus investment on high-impact software solutions: Prioritize the acquisition and development of software applications that have demonstrated strong effectiveness in supporting the value chain, particularly in teaching, research, and community engagement.
- Foster integration with national and international academic networks: Strengthen collaboration with other universities to exchange digital experiences and technologies, enhancing the university's readiness for the demands of digital higher education.

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