

Human Resources and Digital Transformation amid Algeria's Current Transitions: An Econometric Study (2018–2022)

الموارد البشرية والتحول الرقمي في ظل تحولات الراهنة للجزائر – دراسة قياسية خلال الفترة (2022–2018)

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Abstract:

This study aims to assess the relationship between human resources and digital transformation in the context of Algeria's current transitions from 2018–2022. It employs a multiple linear regression model, with Algeria's Digital Network Readiness Index as the dependent variable and Algeria's Global Innovation Index (Intellectual Property) as the independent variable. To achieve an optimal pathway forward, it is necessary to invest in a competent human resource base, which in turn requires the adoption and development of a digital network. Accordingly, this study seeks to identify and examine the study variables while also addressing the principle of employing digital technologies in human resource management. The findings indicate a statistically significant effect between the study variables in Algeria, and the regression model is also statistically significant.

Keywords: Human resources; digital transformation; cost; change; innovation.

ملخص:

تهدف هذه الدراسة إلى قياس الموارد البشرية والتحول الرقمي في ظل التحولات الراهنة للجزائر خلال الفترة (2022_2018)، وهذا باستخدام منهجية الانحدار الخطي المتعدد اعتمادا على مؤشر جاهزية الشبكة الرقمية للجزائر كمتغير تابع يفسره مؤشر ابتكار العالمي للملكية الفكرية للجزائر كمتغير مستقل، ومن أجل الوصول لحل أمثل لتقدم قدما لا بد من استثمار في المورد البشري ذو كفاءة مما يستدعي تبني وتطوير الشبكة الرقمية، وعليه ستسعى هذه الدراسة عن كشف متغيرات الدراسة، مع التطرق لمبدأ استخدام تكنولوجيا الرقمية للموارد البشرية، وقد خلصت الدراسة إلى وجود أثر معنوي بين متغيرات الدراسة للجزائر، ونموذج الانحدار معنوي .

كلمات مفتاحية: الموارد البشرية، التحول الرقمي، التكلفة، التغير، ابتكار.

INTRODUCTION:

The world is witnessing numerous changes across all economic, political, and social spheres. Accordingly, human resources have become a focal point for driving growth and development, thereby transforming intellectual output into goods and services. Information and knowledge constitute the foundation of economic power and an alternative that surpasses natural resources. Despite these changes, the human element remains fundamental to life in general and to the administrative domain in particular. It is the human element that develops technology; it then operates it; and finally, it benefits from it. Consequently, digital transformation has become a key driver of organisational advancement worldwide, particularly in Algeria. The information technology revolution has generated a new orientation centred on the institutionalisation of digitisation and, subsequently, digital transformation at the level of administrative functions and operations. Therefore, the research problem may be formulated as follows: What is the role of human resources and digital transformation amid Algeria's current transitions from 2018–2022?

To address this problem, the following two hypotheses are posited:

There is no statistically significant effect between digital network readiness and Algeria's Global Innovation Index (intellectual property).

There is a statistically significant effect between digital network readiness and Algeria's Global Innovation Index (intellectual property).

Importance of the Study:

The importance of this study lies in its examination of human resources and digital transformation amid Algeria's current transitions, as this topic is highly important for accelerating growth and keeping pace with the contemporary era.

Objectives of the Study:

This study aims to test the effects of human resources and digital transformation amid Algeria's current transitions from 2018–2022.

Methodology of the Study

This research adopts a descriptive–analytical approach to present and analyse developments in the study variables, as well as an experimental econometric approach, in which statistical methods are employed to measure the effects of human resources and digital transformation amid Algeria's current transitions over the period of 2018–2022, via SPSS version 26.

Structure of the Paper:

The paper is divided into two main sections: the first is devoted to the theoretical framework and an analysis of the role of the two, whereas the second is devoted to the econometric study of the effects of human resources and digital transformation amid Algeria's current transitions from 2018–2022.

Previous studies:

The study by Alilmi and Qawasimi (Qawasimi & Belnour, 2022, pp. 138–152) aimed to examine human resource performance in relation to variables in electronic management. Institutions of all types seek to achieve the objectives for which they were established; accordingly, human resources are regarded as the most important element underpinning institutional viability. The study concluded that human resources bear the burdens of the job, including responsibilities and duties, in accordance with the prescribed performance rate. That work and transactions are exchanged among parties through electronic means rather than through other material methods, such as direct communication.

The study by Wahbah Amal (Amal & Ibtisam, April 24 2022, pp. 1–18) aimed to shed light on digital transformation in Algeria, considering both prospects and challenges, by presenting a range of digital performance indicators, whether at the level of infrastructure in Algeria or Algeria's standing within global and Arab rankings. The study revealed that Algeria's infrastructure has improved compared with that in previous years, positively affecting its

Human Resources and Digital Transformation amid Algeria's Current Transitions: An Econometric Study (2018–2022)

ranking in terms of Arab and global indicators. It also recommended the dissemination of electronic culture while strengthening trust (digital identities, privacy, and security).

The study by Khalid Zahzah (Zahzah, 2024, pp. 135–145) aimed to highlight the relationships among human resource development, human development, and human resource management through a conceptual review. The study concluded that human development is broader than human resource management is; however, considerable confusion arises between the two due to ambiguity in their concepts. Accordingly, the fundamental objective of human resource development, from various perspectives, is to enable the organisation to compete, pursue continuous improvement, apply international standards in work performance, adopt total quality management, and meet human development requirements.

The study by Qasimi Shakir (Shakir & Aws, March 15, 2018, pp. 28–47) aimed to highlight indicators of readiness for entry into the digital economy through an analytical reading of Algeria's situation in light of the international report's readiness index. The study concluded that developing an effective digital economy requires fundamental pillars; in their absence, it cannot develop under any circumstances. Algeria's lag in this field was attributed to political, social, and economic dimensions and not to the state's financial abundance but rather to the absence of foundational pillars. The study recommended adopting a clear strategy to develop national capabilities, enhance the economic environment, and improve the business climate.

What Distinguishes the Current Study from Previous Studies:

In terms of the research setting, the present study is analytical, econometric, and applied. With respect to the application sector, the descriptive–analytical approach is most appropriate for examining and analysing the topic. The sample encompasses global indicators for Algeria, including an exploratory study. In terms of objectives, previous studies have addressed the topic in a general manner and linked it to other variables related to the independent and dependent variables. In contrast, the present study relies on Algeria's global indicators. This study differs from previous studies in that it focuses on the objective of examining the relationship between the independent and dependent variables and the statistical significance of the effect.

1. Theoretical Framework

1.1. Concept of Human Resources:

Human resources are defined as the set of individuals and groups that constitute an organisation at a given time. These individuals differ from one another in terms of their training, experience, behaviour, attitudes, and ambitions; they also differ in their roles, managerial levels, and career paths. Human resources are also defined as the set of activities and processes concerned with managing and developing employees in institutions and organisations. Human resources aim to achieve organisational objectives by maintaining a healthy work environment, engaging employees, and developing them to attain maximum productivity (Karima & Bahra, 2023–2024, p. 11). The American Accounting Committee (1973) defined them as the process of identifying and measuring data related to human resources and communicating this information to the relevant parties. Human resources are also described as a set of attributes and experiences in life, knowledge, creativity, innovation, and energy that people invest in their work; thus, they constitute an investment in human capital to increase its efficiency and provide investment for future use (Fatima & Dinouri, December 2024, p. 1140). In addition, resources can be defined linguistically as "the source, whereas terminologically they include information technology infrastructure, people, money, or anything else that can help deliver an information technology service; resources represent assets in any institution. Human resources, in particular, are the totality of human capabilities and energies available in a given field that can be mobilised to achieve development across various domains and sectors (Buthayna, Bishri, & Amin, 2017–2018, p. 7).

2.1. Principles for Using Digital Technology in Human Resources:

In the transition from traditional management to electronic management, new principles have emerged as follows:

Responsibility: Those who understand and accept their responsibilities while respecting the supply and demand of digital technology also possess sufficient authority to fulfil their responsibilities.

Strategy: Strategic human resource planning is the science and art of formulating, developing, implementing, and evaluating a set of purposeful decisions. The human resource management strategy considers the current and future capabilities of digital technology. Strategic plans related to digital technology address the immediate and long-term needs of an effective, positive human resource strategy.

Acquisition: The acquisition of digital technology should be justified by logical analysis and a transparent, clear decision. A balance is required between benefits and opportunities and costs and risks in both the short and long term.

Performance: Digital technology supports human resource management and provides appropriate services and service levels. The quality of services should meet current and future needs. Digital information systems are used efficiently and effectively within a model of communication and information flow to support and sustain planning processes.

Compliance: Digital technology must comply with all types of legislation, instructions, policies, and applications that are clearly specified, reinforced, and enforceable.

Human behaviour: Digital technology policies, applications, and decisions respect human behaviour and incorporate the current and evolving needs of all.

Strategic alignment: This focuses on ensuring linkage between human resource management and digital technology plans, as well as defining, sustaining, and verifying the proposed plan. It also entails harmonising digital technology processes with the operational processes of human resource management. The strategic orientation aligns with frameworks and coordination mechanisms that link the organisation's core procedures to the pattern of decentralisation.

Value delivery: This consists of implementing the proposed value across all parts of the delivery cycle to ensure that information technology delivers the intended benefits through strategy, with a focus on optimising costs and consolidating the core value of digital technology.

Resource management: This entails optimal investment and sound management of the critical resources of digital technology, namely, applications, infrastructure, and human resources. The key issues are related to the optimal utilisation of knowledge.

Risk management refers to identifying and assessing risks and selecting and managing techniques to address potential risks. It requires organisational managers to be aware of and understand the risks to which the organisation may be exposed. Human resource management must understand the requirements for compliance and transparency regarding significant risks and incorporate them into the organisation's risk management responsibilities.

Performance measurement: Many institutions and bodies place considerable emphasis on performance as the fundamental pillar that enables an institution to measure achieved results. Actual performance is measured in accordance with established standards, and the extent to which actual performance differs from or deviates from these standards is determined. Deviation may be positive if actual performance exceeds the standards in certain aspects. This includes monitoring the implementation of the strategy, completing the project, using resources, process performance, and service delivery.

Accompanying human resource management in fostering digital culture: The transition from traditional to digital administrations is not based solely on computing, the internet, communications networks, or other technical aspects, despite these being essential elements of digital administration. Instead, it is, in the first instance, an administrative issue that depends

Human Resources and Digital Transformation amid Algeria's Current Transitions: An Econometric Study (2018–2022)

on advanced managerial thinking and informed administrative leadership that seeks development and support and strengthens it vigorously to fulfil its primary responsibility, namely, serving beneficiaries and achieving their aspirations while adhering to the highest levels of quality and precision in work (Najat, 2018–2019, pp. 137–141).

3.1. Concept of Digital Transformation:

Digital transformation is the process by which companies move towards a business model that relies on digital technologies to innovate products and services, open new revenue channels, and increase the value of their offerings. Digital transformation is the use of digital technology within work processes and organisational structures. Rudiantara, Indonesia's Minister of Communication and Information, explained that smart digital transformation in Indonesia means answering the question of how the maximum use of digital technology can be achieved for the benefit of all people, not only for the benefit of residents of large cities (Dhiafi & Haroush, 2023, p. 72). It may also be defined as a governmental project encompassing all services of institutions and the various sectors within the state, consisting of transforming vital services related to serving individuals and institutions, as well as diverse investments, from their traditional forms into intelligent electronic forms, on the basis of modern and advanced technologies. Accordingly, it may involve the integration of digital technology into the business world and a fundamental change in how value is delivered to customers; it is also a cultural change that requires institutions to continuously challenge the status quo, experiment, and accommodate failure (Shaoushi & Khelouf, 2023, p. 18). Digital transformation is also understood, for institutions (the supply side), as centring on the transition to harness modern technology and its applications optimally to improve performance and enhance competitiveness. For individuals (the demand side), it centres on obtaining essential services and executing tasks via personal computers, smartphones, and other smart devices at the press of a button without returning to institutions or contacting their customer service centres when specific requirements need to be met. In addition, it refers to the changes brought about by digital technologies to create new processes, cultures, and experiences to meet evolving business and market requirements, and it is considered necessary for building an organisation capable of thriving in the digital age (Sirin & Ibtihal, 2022–2023, pp. 3–4).

4.1. Pillars Underpinning Digital Transformation:

For any digital transformation strategy to be truly effective, it is not sufficient to merely adopt new technologies; transformation must occur across all aspects of the organisation to achieve maximum impact. To realise digital transformation, six fundamental pillars must be taken into account:

Customer experience: Customer-centric business innovation is one of the core pillars guiding digital transformation. It is preferable not to adopt an emerging technology until it has been fully explored within the context of the customer journey, behaviour, and expectations.

People: Employees should feel supported rather than threatened by the adoption of transformative technology. New digital business models cannot succeed unless employees adopt them with genuine commitment. This can be achieved through training, attracting suitable talent, and retaining existing talent by creating growth opportunities.

Change: Efforts devoted to digital transformation bring about change across all aspects of the business. Planning is critical to avoid confusion and disruption from unexpected changes, and the necessary tools and environment must be provided to achieve successful digital transformation.

Innovation:

Despite the close connection between digital transformation and innovation, they are not identical. Innovation involves generating the ideas that drive and guide transformation. This requires providing space for open communication, collaboration, and creative freedom that

encourages employees to experiment. After an idea has been tested, digital transformation can then proceed to implement it on a large scale.

Leadership:

Business leaders should demonstrate proactivity and assume responsibility for all digital transformations. They must think about the future, explore technology from multiple angles, and inspire others to do the same.

Culture:

When leaders of digital transformation implement the five preceding pillars, a culture of innovation emerges. With enthusiastic employees eager to deliver the best possible customer experience, digital transformation initiatives will expand and soon achieve success (Mansouri & Tijani, 2023, pp. 8–9).

5.1. The Link between Digital Development (Digital Transformation) and Human Resource Development:

The most salient problems that limit the effective use of digital technology are as follows:

A lack of attention has been given to scientific and applied research.

Obstacles to developing digital technology within organisations.

Weak public and private funding for research and development activities.

The gap between digital technology and human resource development.

Weak mechanisms for activating digital services.

This reflects the importance of developing human capacities in light of technological and economic changes while accounting for the cumulative role of knowledge and technology. Conversely, institutions face difficulties in supporting a digital technology system that has not reached the required level within organisations, thereby expanding the sphere of technological underdevelopment and slowing the absorption of modern technology. Consequently, the level and effectiveness of the optimal use of available technical and human capacities have declined, resulting in adverse effects on performance.

Human resource development requires the formulation of strategies to develop and enhance it to absorb advanced technology. Training methods and approaches for developing individuals' skills and performance have diversified through technologies such as satellite-based education, learning via the international information network, and distance learning. As previously noted, more than 70% of success or failure is attributable to human resources. Jeffrey Pfeffer, in his book *Competitive Advantage Through People*, emphasises that many organisations have made substantial investments in the technology used without making comparable investments in the continuous development of human resources in relation to that technology (Tawfiq, 2015–2016, pp. 148–149).

2. Measuring Human Resources and Digital Transformation amid Algeria's Current Transitions (2018–2022)

1.2. Study Model and Variables:

To examine human resources and digital transformation amid Algeria's current transitions, annual time series data were used for the period of 2018–2022. Data for Algeria's Digital Network Readiness Index were obtained from the 2023 *Network Readiness Index*. Data for Algeria's Global Innovation Index of the World Intellectual Property Organisation were obtained from the 2022 reports of the Directorate of Statistics, Studies, and Forecasting.

The study variables are denoted as follows:

DNRI: Algeria's digital network readiness index.

SIIP: Algeria's Global Innovation Index of the World Intellectual Property Organisation.

Human Resources and Digital Transformation amid Algeria's Current Transitions: An Econometric Study (2018–2022)

2.2. Analysis and Discussion of the Results

Table 1

Descriptive Statistics

Variable	Mean	Standard deviation	N
DNRI	37.2150	2.30961	4
SIIP	20.0150	3.00055	4

Note. Source: SPSS v26 output.

The preceding table presents the descriptive statistics, indicating a sample size of 4. The arithmetic means for digital network readiness and the Global Innovation Index (intellectual property) for Algeria were 37.2150 and 20.0150, respectively, whereas the standard deviations were 2.30961 and 3.00055, respectively, as these variables were entered into the regression model as the dependent and independent variables.

Table 2

Correlation Matrix

		DNRI	SIIP
Pearson correlation	DNRI	1.000	−0.683
	SIIP	−0.683	1.000
Sig. (one-tailed)	DNRI	.	0.159
	SIIP	0.159	.
N	DNRI	4	4
	SIIP	4	4

Note. Source: SPSS v26 output.

The preceding table presents the correlation matrix for the regression model, with the highest correlation coefficient between digital network readiness and the Global Innovation Index (intellectual property) being −0.683, which is significant at the 0.01 level. In contrast, the lowest correlation coefficient between them was the same value, with a significance level smaller than 0.01.

Table 3

Variables Entered/Removed

Model	Variables entered	Variables removed	Method
1	SIIP ^b	.	Enter

Note. a. Dependent variable: DNRI. b. All requested variables were entered—*source:* SPSS v26 output.

The preceding table lists the variables included in the regression equation: digital network readiness as the dependent variable and the Global Innovation Index (intellectual property) as the independent variable. The analysis did not exclude any variables, and the model used was standard regression.

Table 4

Model Summary

Model	R	R ²	Adjusted R ²	Standard error of the estimate
1	0.683 ^a	0.466	0.199	2.06687

Note. a. Predictors: (Constant), SIIP. b. Dependent variable: DNRI. *Source:* SPSS v26 output.

The preceding table shows Pearson's correlation coefficient between the dependent and independent variables, which reached a moderate value of 0.683, with a coefficient of determination (R²) of 0.466 and an adjusted R² of 0.199; that is, the independent variables yield 19% of the variance in Algeria's digital network readiness.

Table 5
ANOVA

Model	Sum of squares	df	Mean square	F	Sig.
1 Regression	7.459	1	7.459	1.746	0.317 ^b
Residual	8.544	2	4.272		
Total	16.003	3			

Note. a. **Dependent variable:** DNRI. b. Predictors: (Constant), SIIP. *Source:* SPSS v26 output.

The preceding table presents the ANOVA results for testing the significance of the regression. The Sig. The value is 0.317, which is less than 0.01; therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted, namely, that the regression is significant. Accordingly, the independent variable affects the dependent variable, and the dependent variable can be predicted from these independent variables.

Table 6

Standardised and Unstandardised Regression Coefficients

Mode l	Unstandardise d coefficients	Standardise d coefficients	t	Sig.	Collinearit y statistics
	B	Standar d error	Beta		Tolerance
1 (Constant)	47.733	8.027		5.947	0.027
SIIP	-0.526	0.398	-0.683	-1.321	0.317

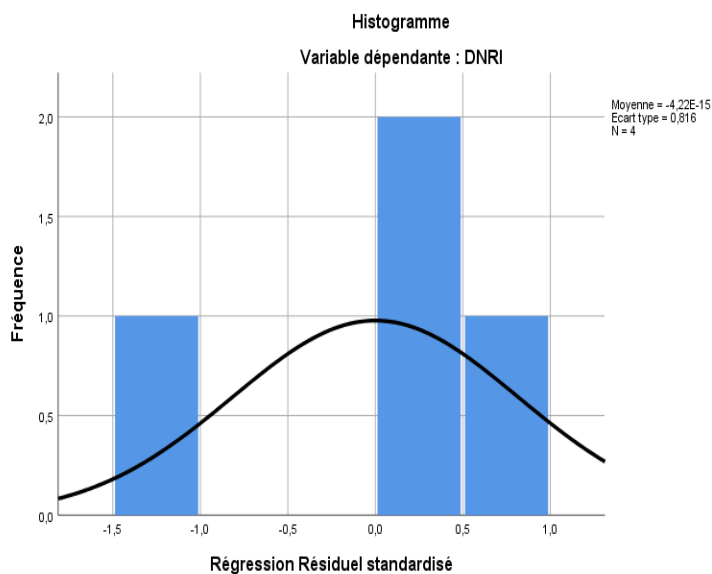
Note. a. **Dependent variable:** DNRI. *Source:* SPSS v26 output.

The preceding table presents the standardised and unstandardised regression coefficients, the standard error, the *t* test value, the probability value (statistical significance), the variance inflation factor (VIF) and tolerance coefficients. Since Tolerance = 1/VIF, the results indicate the absence of multicollinearity, as the VIF values are less than 3. The table also allows for the derivation of the regression equation.

Predicted DNRI = $e + (\text{SIIP} \times -0.683)$.

Figure 1

Results of the Test of Residual Distribution and Data Dispersion

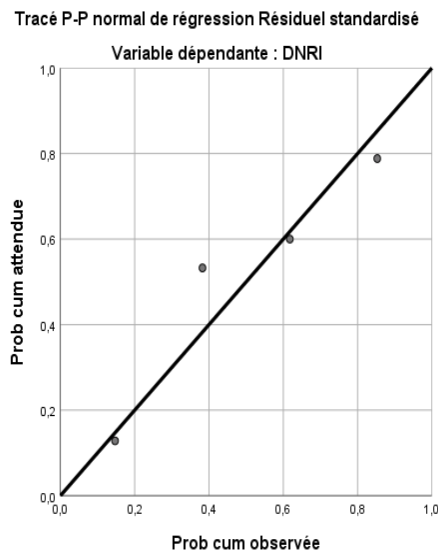


Note. *Source:* SPSS v26 output.

Human Resources and Digital Transformation amid Algeria's Current Transitions: An Econometric Study (2018–2022)

Figure 2

Results of the Test of Residual Distribution and Data Dispersion



Note. Source: SPSS v26 output.

The preceding figures indicate that the residuals are normally distributed and that the data cluster around a straight line. Accordingly, the residuals follow a normal distribution, which satisfies a key assumption for the validity of regression analysis.

Conclusion:

This study examined human resources and digital transformation amid Algeria's current transitions from 2018–2022 via an econometric analysis based on a multiple regression methodology. It relies on Algeria's Digital Network Readiness Index as the dependent variable, with Algeria's Global Innovation Index from the World Intellectual Property Organisation as the independent variable. Prior to this, the study reviewed selected prior studies and discussed theoretical concepts relevant to the study variables. The study yielded the following results:

- There is a positive relationship between the study variables.
- The regression model is statistically significant; that is, the independent variables affect the dependent variable.
- The existence of a statistically significant effect between the independent and dependent variables.
- The absence of multicollinearity among the study variables.

Accordingly, the null hypothesis is rejected, and the alternative hypothesis is accepted.

In light of the foregoing results, the following recommendations are proposed:

- Digital transformation should be regarded as a determinant of facilitating processes.
- Intellectual property is of central importance to an institution's business models.
- Greater attention should be devoted to, and efforts should be intensified towards, reforms to improve digital network readiness.

- Efforts should be made to develop intellectual awareness in the era of digital transformation.

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