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Digital Transformation as a Lever for Economic Diversification in a Hydrocarbon-Dependent Economy: Survey Evidence from Algeria

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***Abstract*—**Algeria presents digital transformation as one of its main routes away from hydrocarbon dependence, but there is little evidence on whether people working inside the economy see digitalisation changing its structure. This paper uses a survey of 124 respondents in Mascara province, read against national policy documents and UN e-government indicators, to examine the relationship between digital transformation and perceived economic diversification. Digital transformation is measured on four dimensions: strategic vision, infrastructure readiness, service quality and financial readiness. Respondents rate overall digital transformation (M = 3.34) and diversification (M = 3.36) as moderate on a five-point scale. A simple regression of diversification on overall digital transformation gives $\beta = 0.74$ and $R^2 = 0.55$, and each dimension is individually significant. The dimensions differ sharply, however. Strategic vision is rated favourably but explains only 9 per cent of the variance in diversification, whereas infrastructure, the lowest-rated dimension (M = 2.87), explains 31 per cent. Ratings do not differ by gender, education or sector. We read the results as describing a latent rather than a realised diversification lever, in which operational foundations matter more than declared strategy. Because the sample is non-probabilistic and both scales come from the same respondents, the findings are associations, not causal estimates.

***Keywords*—**digital transformation; economic diversification; rentier economy; Algeria; survey research

1. Introduction

Hydrocarbons still sit at the centre of Algeria's export earnings and public finances. The price collapses of 1986 and 2014 each set off a round of official commitments to diversify, and each time the structure of the economy changed less than the rhetoric suggested. The current attempt leans heavily on digitalisation. A national strategy branded Digital Algeria 2030 organises the effort around five pillars (infrastructure, training, digital governance, the digital economy and digital society), and a High Commission for Digitalisation attached to the Presidency coordinates it.

Recent work frames this as a transition rather than a breakthrough. In a comparative study of oil-producing economies, Mokaddem et al. (2025) find that Algeria's non-hydrocarbon sectors now account for a growing share of output, reported at more than 65 per cent of GDP, while non-hydrocarbon exports remain a small share of total exports, which they estimate at 10 to 15 per cent. Production, in other words, is diversifying faster than exports. Their evidence comes from aggregate indicators. Ours comes from the people who use digital systems, and it asks whether those people see digitalisation as part of the same transition.

The reasoning behind that bet is easy to state. Digital tools cut the cost of reaching customers, allow small firms to sell services across borders, and make room for activities such as software, online platforms, fintech and remote education, whose main input is skill rather than a natural resource. If these effects appear at scale, digitalisation

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would help build the productive base that a rentier economy lacks.

Whether they are appearing is a separate question, and the available evidence answers it only in part. Strategy documents record intentions. International indices such as the UN E-Government Development Index record the state of government services. Neither says much about how firms, public employees and university staff, the people who actually use the systems, experience digitalisation, or whether they think it is altering the structure of the economy. The distinction matters because a diversification strategy depends on the behaviour of many decentralised actors. If the people who run, use and finance digital systems do not see them delivering new markets, new firms or new activities, the strategy is unlikely to change the economy's structure however ambitious it looks on paper.

Algeria is a useful case for three reasons. It remains heavily exposed to hydrocarbon price swings. It has publicly committed to digitalisation as an instrument of diversification. And its standing in international e-government indices is modest even as its scores rise. That combination lets us ask whether policy ambition and lived experience point in the same direction.

This paper addresses that gap with survey data collected in Mascara province, read against the national policy and indicator background. It asks three questions. First, how do respondents rate the four dimensions of digital transformation and the degree of diversification? Second, is digital transformation associated with perceived diversification, and which dimensions carry the association? Third, do these ratings differ by gender, education or sector?

The paper makes three contributions. It breaks digital transformation into four dimensions instead of treating it as a single index, and shows that the dimensions behave very differently. It adds respondent-level evidence on a country where much of the literature we draw on is descriptive or institutional. And it offers a reading of the Algerian case, a gap between declared vision and operational foundations, that later work can test with objective data.

Section 2 reviews the literature and the Algerian policy context and states the hypotheses. Section 3 describes the data and methods. Section 4 reports the results and Section 5 discusses them. Sections 6 to 8 cover policy implications, limitations and conclusions.

2. Background and hypotheses

2.1 Diversification and the rentier problem

The resource-curse literature gives the standard reason why diversification matters. Auty (1993) argued that mineral-rich economies tend to grow more slowly than their endowments would suggest, and Sachs and Warner (1995) found a negative cross-country relationship between resource abundance and growth. Later work is more careful about how general the pattern is. Ross (2015), reviewing the evidence, concludes that resource wealth does damage in some settings, including to governance, and that the strength of the effects depends heavily on context. For an economy like Algeria's the practical worries are familiar: an exchange rate that favours imports over local production, fiscal revenue that moves with the oil price, and little pressure on firms to compete outside protected markets.

Diversification is usually measured through the concentration of output or exports. Imbs and Wacziarg (2003) show that countries first spread activity across more sectors as incomes rise and only later re-concentrate, so the early stages of development involve broadening the base. What a country produces matters as well as how many things it produces. Hausmann, Hwang and Rodrik (2007) show that countries specialising in goods typical of richer economies tend to grow faster, and Hidalgo and Hausmann (2009) read the products a country makes as a record of the productive capabilities it has accumulated. On this view, diversifying a rentier economy is less about opening a new sector than about accumulating the capabilities, in skills, organisations and infrastructure, that make new sectors possible.

Aggregate evidence for Algeria points to a partial and uneven picture. Mokaddem et al. (2025) compare Norway, the United Arab Emirates, Saudi Arabia and Algeria on the share of oil in GDP, the share of non-hydrocarbon exports and the contribution of non-oil sectors to GDP. They classify Norway and the UAE as highly diversified, Saudi Arabia as intermediate and Algeria as progressing. Their reading of the Algerian case is one of partial internal diversification: the national production base is broadening faster than the export structure, which they link to the expectation that productive diversification precedes export diversification (Hausmann et al., 2007). They also stress that outcomes depend on the quality of institutions and the coherence of long-term public

policy, and they list the digital economy among the alternative sectors that Algeria and other oil-dependent countries should develop. Their study works at the level of national aggregates and says little about the mechanisms through which any one sector, digitalisation included, contributes. That is the gap our survey addresses.

2.2 Digitalisation as a diversification channel

Three terms are often used interchangeably and should not be. Digitisation converts analogue information into digital form. Digitalisation uses digital technologies inside existing processes. Digital transformation refers to the organisational and strategic change that digital technologies make possible, including new business models and new ways of creating value (Vial, 2019; Verhoef et al., 2021). Bukht and Heeks (2017) add that the digital economy has layers, from a core digital sector to a wider set of activities changed by digital inputs. Our survey measures perceptions of digital transformation in this broad sense, not the size of a digital sector.

The channels through which digital transformation could support diversification are fairly clear. It can widen market access for small and medium enterprises, because selling online or exporting services needs less physical presence. It can encourage new firms, especially in services where start-up costs are low. It can raise productivity in existing sectors such as agriculture, manufacturing and trade. And digital government can lower the transaction costs firms face when dealing with the state. Several Gulf economies have written digital strategies directly into post-oil development visions. Ben Azza and Toumi (2024) review the experiences of the UAE, Qatar and China and conclude that Algeria could draw on them if legal frameworks, international partnerships and specialised human capital are developed.

There are good reasons for caution too. Digital systems can be added to an unchanged production structure and leave it largely as it was. Brynjolfsson and McAfee (2014) stress that returns to digital technology depend on complementary changes in organisations and skills. Imported platforms can capture value that domestic firms never see, and skills gaps limit what firms can do with the tools they have. Algerian studies tend to land on similar conditions. Zemouli et al. (2024), using a questionnaire given to firms, report that digitalisation strengthens competitiveness, but only where infrastructure and training are in place. The effect of digital transformation on diversification is therefore conditional, and the conditions are an empirical matter.

A final conceptual point concerns evidence. Objective indicators of digital transformation, such as connectivity, platform usage or the digital sector’s share of output, are scarce at sub-national level and say little about whether organisations can actually use what exists. Perceptions are an imperfect substitute, but they capture something objective indicators miss: the experience of the people who depend on the systems every day. A strategy whose users do not believe in it, or cannot rely on it, is unlikely to generate the investment and behavioural change that diversification requires. We therefore treat perceptions as informative about the conditions for diversification while recognising, in Sections 5 and 7, what they cannot show.

2.3 Algeria’s digital strategy and its measured results

Algeria’s recent approach is set out in the National Strategy for Digital Transformation prepared under the High Commission for Digitalisation (High Commission for Digitalisation, 2024). Officials have announced more than 500 projects for 2025–2026, with about three-quarters aimed at transparency and simpler administrative procedures (MEA Tech Watch, 2025). The emphasis on public services is understandable, since the state is the largest user of digital systems and the quickest place to show results. It also means that the strategy’s first test is administrative efficiency. Its contribution to economic diversification is a more indirect and longer-term claim.

Digitalisation is one strand of a wider diversification effort. Mokaddem et al. (2025) list the promotion of non-hydrocarbon exports, Saharan agriculture, renewable energy and support for start-ups and incubators, including the Algerian start-up fund created in 2020, among the measures the country has taken. Digital transformation sits close to the last of these, since start-ups and online services depend on the systems we study.

The UN E-Government Development Index (EGDI) gives a measured view of one part of this effort (Figure 1). Algeria’s score rose from 0.4227 in 2018 to 0.5173 in 2020, 0.5611 in 2022 and 0.5956 in 2024. Its global rank improved from 130th to 120th and then to 112th over the first three of those years, then slipped back to 116th in 2024 as other countries moved faster (United Nations DESA, 2024). In the same 2024 edition Algeria ranked 187th of 193 countries on the e-participation index. Progress is therefore real, and it is uneven: services have improved in absolute terms, while citizens’ ability to interact with the state online remains limited by international standards.

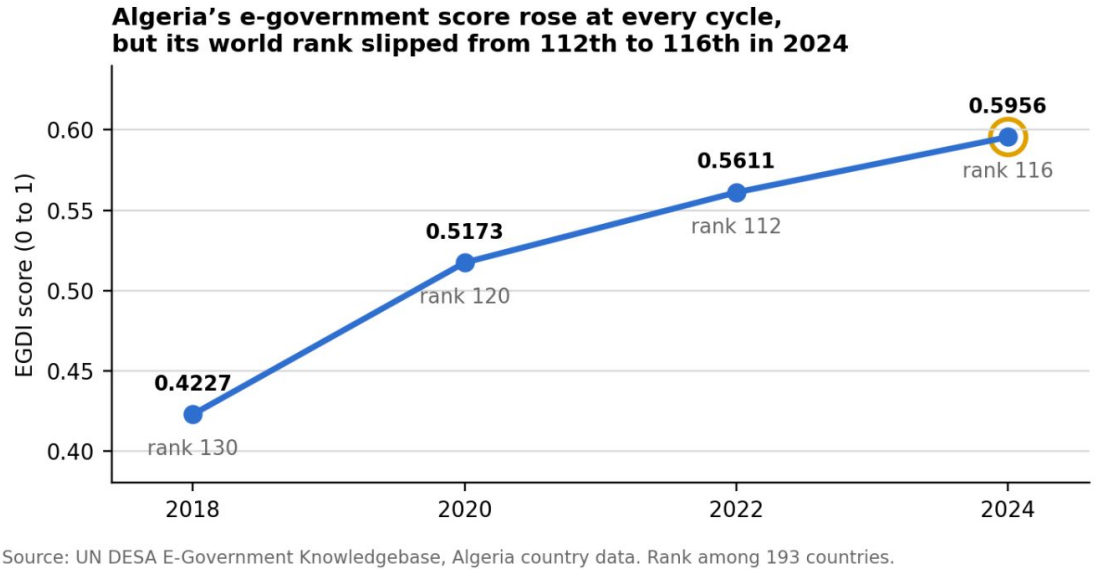


Figure 1. Algeria's UN E-Government Development Index, 2018–2024

2.4 Conceptual framework and hypotheses

The four dimensions correspond to different links in the chain between a digital strategy and an economic outcome. Strategic vision captures whether the state's direction is clear, credible and connected to diversification; it is the layer at which intentions are set and communicated. Infrastructure readiness captures whether the technical base (connectivity, data capacity, system stability, integration and security) can carry digital activity. Service quality captures how the people and organisations that use digital services experience them, in usability, speed, support and efficiency gains. Financial readiness captures whether organisations can afford to adopt and sustain digital solutions. In capabilities terms (Hidalgo & Hausmann, 2009), the last three describe resources that firms and administrations can draw on, while the first describes the framework that is supposed to coordinate them.

This structure suggests why the dimensions might relate differently to diversification. A diversification effect requires an organisation to do something new with digital tools, such as reaching a new market or launching a new product. That is more likely when the infrastructure works, services are usable and funds are available. Vision can raise expectations and guide investment, but its effect on any single organisation passes through those other layers. We therefore expect all four dimensions to be positively related to perceived diversification, and we treat the relative strength of the relationships as an empirical question.

The discussion leads to the following hypotheses, summarised in Figure 2.

- **H1.** Digital transformation is positively associated with perceived economic diversification.
- **H2a–H2d.** Each of the four dimensions of digital transformation (strategic vision, infrastructure readiness, service quality and financial readiness) is positively associated with perceived economic diversification.
- **H3.** Ratings of digital transformation and diversification differ by gender, education level and sector. This hypothesis is exploratory and no direction is predicted.

Because the literature points to conditions rather than to a single effect, we do not expect the four dimensions to matter equally, but we do not specify an ordering in advance.

3. Data and method

3.1 Sample

The data come from a questionnaire survey in Mascara province. We distributed 130 questionnaires to people reached in person, without restricting the sample to one sector or organisation. 124 were returned and usable (a usable rate of 95.4 per cent) and six were not returned. Respondents were approached where they could be found, among them students, employees and academics, so the sample is a non-probability one and its results should not be treated as representative of the province or of Algeria. Table 1 and Figure 3 show its composition.

Digital system use is self-rated.

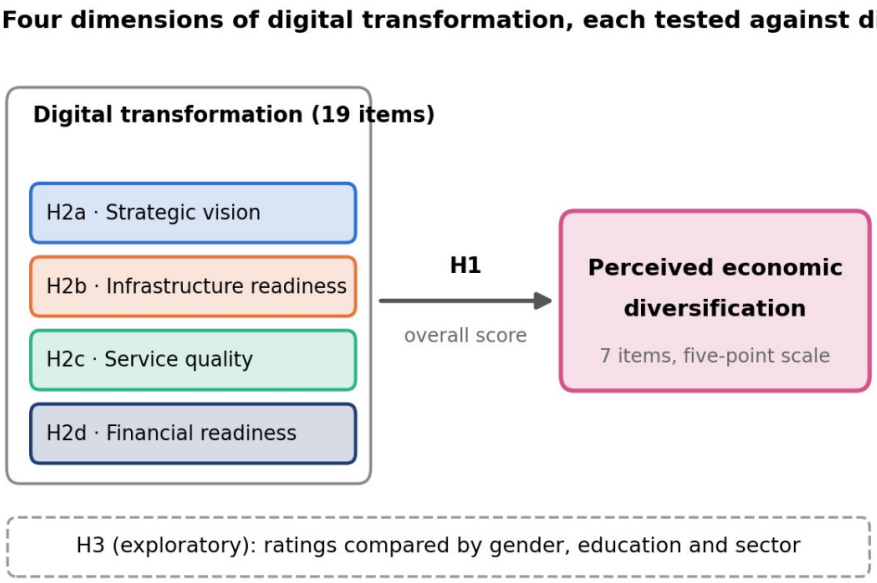


Figure 2. Conceptual model and hypotheses

Table 1. Sample characteristics (N = 124)

Characteristic	Category	n	%
Gender	Female	80	64.5
	Male	44	35.5
Age	Under 25	50	40.3
	25–34	31	25.0
	35–44	25	20.2
	45–54	16	12.9
	55 and over	2	1.6
Education	Secondary or less	10	8.1
	Technical or vocational	8	6.5
	University degree	100	80.6
	Doctorate or higher	6	4.8
Sector	Universities and research	65	52.4
	Public sector	50	40.3
	Private sector	8	6.5
	Other	1	0.8
Digital system use	Low	18	14.5
	Medium	74	59.7
	High	32	25.8

The sample is young (65 per cent are under 35), highly educated (about 85 per cent hold a university degree or higher) and weighted toward universities and research (52 per cent) and the public sector (40 per cent). Only eight respondents work in the private sector. Women make up almost two-thirds of the sample. These features matter for interpretation: the respondents are, on the whole, people who use digital systems routinely and who are well placed to judge them, but they are not a cross-section of the economy’s firms or workers.

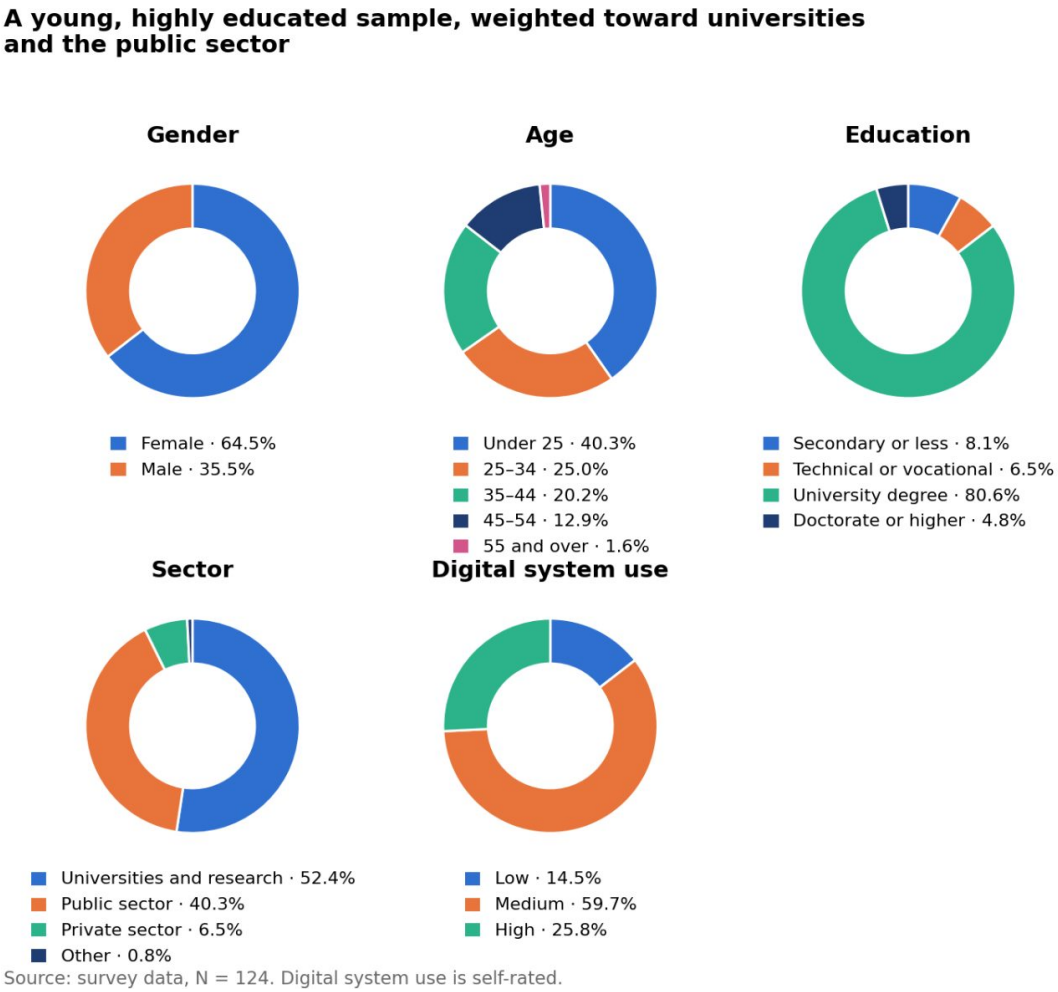


Figure 3. Sample profile by gender, age, education, sector and use of digital systems

3.2 Instrument and reliability

The questionnaire had three parts: respondent characteristics, 19 items on digital transformation and 7 items on economic diversification. All items used a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Digital transformation was divided into four dimensions: strategic vision and economic support (5 items), infrastructure readiness and system stability (5 items), service quality and user experience in economic sectors (5 items), and financial and economic readiness (4 items). The diversification items asked, for example, whether digitalisation had helped create jobs in new sectors, helped small firms reach new markets, supported exportable products and services, increased the number of start-ups and reduced dependence on hydrocarbons. The full list of items is in Appendix A. Content validity was checked by having the questionnaire reviewed and revised by the academic supervisor. No factor analysis was run.

Two features of the instrument are worth stating plainly. First, the digital transformation items are mostly about the respondent's own organisation or about government systems the respondent uses, so they measure perceived readiness and experience, not objective performance. Second, the diversification items ask whether digitalisation has contributed to a given change. They therefore measure perceived effects attributed to digitalisation and not diversification itself, a point we return to in Sections 5 and 7.

To interpret means, the five-point range was divided into equal bands of 0.80: 1.00–1.80 very low, 1.81–2.60 low, 2.61–3.40 moderate, 3.41–4.20 high and 4.21–5.00 very high. Internal consistency was assessed with Cronbach's alpha (Cronbach, 1951). Alpha values, reported with the descriptive statistics in Table 2, range from 0.639 to 0.852 for the scales and reach 0.900 for the full 26-item instrument. The strategic vision dimension falls below the 0.70 benchmark usually cited for established scales (Nunnally, 1978), and results for that dimension should be read with this in mind.

3.3 Analysis

Data were analysed in SPSS. We report frequencies, means and standard deviations, and use Kolmogorov–Smirnov tests to check normality (statistics of 0.048 for digital transformation and 0.070 for diversification, both with significance at .200, the lower bound SPSS reports, so normality was not rejected). H1 and H2a–H2d are tested with simple linear regressions of the diversification score on the overall digital transformation score and, separately, on each dimension score. Each model has a single predictor, so the coefficients describe bivariate associations and not the effect of one dimension holding the others constant. R^2 is computed in each model as the regression sum of squares divided by the total sum of squares. Group differences (H3) are examined with independent-samples tests for gender and one-way ANOVA for education and sector.

Several reading rules guide the analysis. Because every model has one predictor, the standardised coefficient equals the correlation between predictor and outcome, so β and the square root of R^2 coincide, and the unstandardised coefficient B gives the expected change in the diversification rating for a one-point change in the predictor on the five-point scale. We treat R^2 as a description of fit in this sample and do not compare the models as if they were nested. With 124 observations the regressions have ample power to detect moderate and large associations, but the group comparisons, which divide the sample into small subgroups, do not.

4. Results

4.1 Descriptive statistics

Table 2 summarises the ratings and the reliability of each scale.

Table 2. Descriptive statistics and reliability

Scale	Items	Cronbach's α	M	SD	Level
Strategic vision and economic support	5	0.639	**3.54**	0.63	**High**
Infrastructure readiness and system stability	5	0.799	**2.87**	0.84	**Moderate**
Service quality and user experience	5	0.757	**3.41**	0.78	**Moderate**
Financial and economic readiness	4	0.758	**3.56**	0.74	**High**
Digital transformation (overall)	19	0.852	**3.34**	0.55	**Moderate**
Economic diversification	7	0.801	**3.36**	0.64	**Moderate**

Note. Five-point scale. Levels are assigned from unrounded means; the service-quality mean (3.4065) falls just below the 3.41 threshold for 'high'. The full 26-item instrument has α = 0.900.

Overall digital transformation is rated moderate, and so is diversification. The dimensions are far from uniform. Strategic vision and financial readiness are rated high, service quality sits just under the high threshold, and infrastructure is the lowest at 2.87, the only dimension mean below the scale midpoint of 3.

Item-level results add some texture (Figure 4). Within the vision dimension, respondents agree most strongly that the national vision gives clear weight to diversification (M = 3.90) and that digital projects aim at innovation and new activities (3.78). They agree least that they personally know the state's strategy well (M = 3.29) or that government communicates its digital policies effectively to institutions (M = 3.31). Support for the direction of policy is thus broader than understanding of it. Within infrastructure, every item stays in the moderate range. Stable operation of government platforms scores lowest (2.59), followed by integration between administrations' systems (2.81), internet quality (2.90) and national cloud and data-centre provision (2.95). Digital security scores highest (3.08). In the service dimension, respondents most readily agree that digital services help organisations work more efficiently (3.67) and that digitalisation has cut costs and procedures (3.60). They agree least that technical support is adequate (3.10).

The diversification scale shows a similar pattern of uneven credit. In the survey output, respondents ranked the statement that digitalisation helped small and medium enterprises enter new markets first, followed by the increase in technology start-ups, the development of exportable products and services, the emergence of new economic activities, job creation in new sectors and higher productivity in agriculture, industry and services. The statement that digitalisation reduced dependence on hydrocarbons ranked last of the seven. Respondents therefore credit digitalisation more readily with opening markets and creating firms than with loosening the economy's

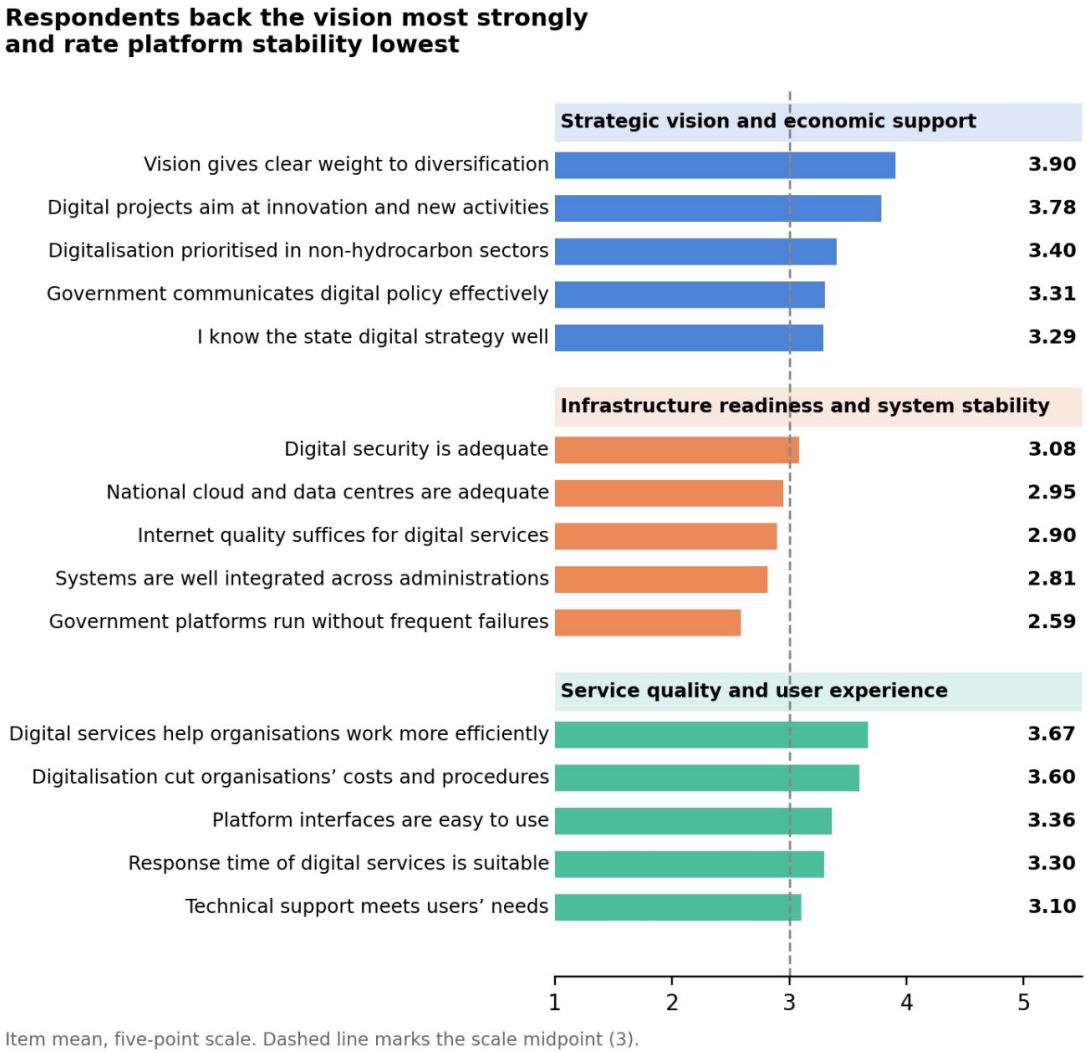


Figure 4. Item-level mean ratings for the vision, infrastructure and service dimensions

reliance on oil and gas, which is the ultimate aim of diversification.

4.2 Digital transformation and diversification

Table 3 reports the five simple regressions, and Figure 5 shows how each dimension's mean rating relates to its R^2.

Table 3. Simple regressions of perceived economic diversification on digital transformation and its dimensions

Predictor	B	SE	β	t	F(1, 122)	R^2
Digital transformation (overall)	0.862	0.070	0.742	12.24	149.69	**0.551**
Strategic vision	0.298	0.088	0.294	3.40	11.53	**0.086**
Infrastructure readiness	0.422	0.057	0.555	7.37	54.35	**0.308**
Service quality	0.513	0.058	0.625	8.84	78.12	**0.390**
Financial readiness	0.573	0.058	0.666	9.87	97.40	**0.444**

Note. N = 124. All models significant at $p < .001$ except strategic vision ($p = .001$). R^2 computed as regression sum of squares over total sum of squares (total SS = 50.469). Darker R^2 cells indicate larger shares of explained variance.

Overall digital transformation is strongly associated with diversification (B = 0.862, SE = 0.070, t = 12.24, $p < .001$) and accounts for 55.1 per cent of its variance. A one-point difference in the overall digital transformation rating goes with a difference of 0.86 points in the diversification rating. H1 is supported.

The dimension-level models support H2a–H2d, but the strength of the association differs widely. Financial readiness accounts for 44.4 per cent of the variance in diversification, service quality for 39.0 per cent and infrastructure readiness for 30.8 per cent. Strategic vision accounts for 8.6 per cent. Put differently, one of the two highest-rated dimensions is the one least related to perceived diversification, while the lowest-rated dimension is related to it quite strongly. Because the dimensions are correlated and each model has one predictor, these R^2 values cannot be added up or read as separate contributions.

To put the size of the overall association in context, the overall digital transformation score has a standard deviation of 0.55 scale points. Respondents who rate digital transformation one standard deviation higher therefore also rate diversification about 0.74 standard deviations higher ($\beta = 0.742$), or roughly 0.48 points on the five-point scale. This is a large association by the usual standards of survey research. It is large enough that the two scales almost certainly share a common component beyond the substantive link, a point we take up in Section 5.1.

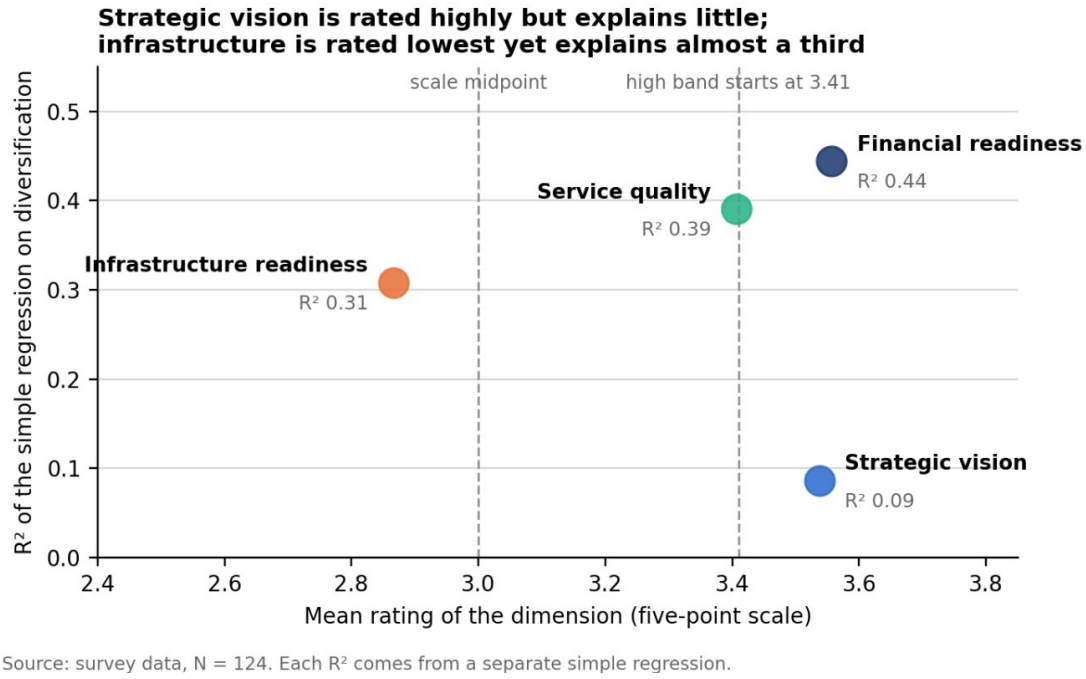


Figure 5. How highly each dimension is rated against how much of diversification it explains

4.3 Differences by gender, education and sector

Neither digital transformation nor diversification ratings differ significantly by gender, education or sector, so H3 is not supported. Women's and men's means are nearly identical (digital transformation 3.36 versus 3.31; diversification 3.35 versus 3.37). By education level, one-way ANOVA gives $F = 0.15$ ($p = .93$) for digital transformation and $F = 0.62$ ($p = .60$) for diversification. By sector, the results are $F = 1.75$ ($p = .16$) and $F = 0.57$ ($p = .64$). Private-sector respondents give the highest digital transformation score ($M = 3.68$) and public-sector respondents the lowest ($M = 3.24$), but the private group has only eight members, the 'other' category has one, and the difference is not statistically significant.

The lack of group differences is informative, with a caveat. In a sample this young and educated, with so many university and public-sector respondents, it suggests views are fairly uniform within this particular population. It may also reflect low power in the smaller subgroups.

4.4 Summary of hypothesis tests

Table 4. Hypotheses and outcomes

Hypothesis	Statement	Evidence	Outcome
H1	Digital transformation is positively associated with perceived diversification	$R^2 = 0.551$	**Supported**
H2a	Strategic vision is positively associated with perceived diversification	$R^2 = 0.086$	**Supported (weak)**

Table 4. Hypotheses and outcomes *(continued)*

Hypothesis	Statement	Evidence	Outcome
H2b	Infrastructure readiness is positively associated with perceived diversification	$R^2 = 0.308$	**Supported**
H2c	Service quality is positively associated with perceived diversification	$R^2 = 0.390$	**Supported**
H2d	Financial readiness is positively associated with perceived diversification	$R^2 = 0.444$	**Supported**
H3	Ratings differ by gender, education and sector	All $p > .05$	**Not supported**

5. Discussion

5.1 A moderate and uneven transition

Three findings stand out. Ratings of both digital transformation and diversification sit in the middle of the scale. The two are strongly associated. And the dimensions of digital transformation differ both in how they are rated and in how closely they relate to diversification. Together these fit an economy in the middle of a transition: the policy direction is endorsed, operational foundations are weaker, and visible economic effects are partial.

The strong association needs careful reading, for two reasons. First, both scales come from the same respondents, so common-method variance may inflate the relationship (Podsakoff et al., 2003). Second, and more specific to this instrument, several diversification items are worded as attributions to digitalisation, for instance that digitalisation helped small firms enter new markets. A respondent who rates digital systems favourably is likely to agree with such statements, so part of the association is built into the measures. We therefore read $R^2 = 0.55$ as showing that people who see strong digital foundations also see digitalisation producing economic change. It is not an estimate of what digitalisation does to the structure of the economy. Our conclusions concern perceptions.

5.2 Declared vision versus operational foundations

The weak association for strategic vision is the most interesting result. Respondents think the national vision takes diversification seriously, yet how highly they rate the vision tells us little about how much diversification they perceive. Two measurement explanations should be set aside before turning to substance. The vision scale has the lowest reliability ($\alpha = 0.639$), and measurement error weakens correlations. It also has a narrower spread ($SD = 0.63$) than the other dimensions, and a narrower predictor range lowers correlations too. Both could contribute. But the gap is large (R^2 of 0.09 against 0.31 to 0.44), which makes it hard to put down to measurement alone.

A substantive reading is that vision is declaratory. Respondents can endorse it without having seen it change anything around them, whereas their experience of infrastructure, services and funding is direct. This fits the lower scores on the items about personal knowledge of the strategy and about government communication. A vision that people approve of but do not know in detail is unlikely to shape what they see happening in the economy.

It would be a mistake to conclude that vision is unimportant. Vision may be a necessary condition that enables the other layers by shaping funding priorities, procurement and regulation. Our design cannot detect such upstream effects, because respondents' ratings of their own organisation's budget or of platform stability may already reflect earlier strategic decisions. What the data show is narrower: among people who experience the system, differences in perceived vision do not line up with differences in perceived diversification.

5.3 Infrastructure as a constraint

Infrastructure shows the opposite pattern: the lowest rating, yet an association strong enough to explain almost a third of the variance. This is what a bottleneck would produce. Where systems are unreliable and poorly integrated, respondents also report fewer diversification effects, and where they are stable, they report more. The weakest item, stable operation of government platforms, sits comfortably beside the international picture, in which Algeria's e-government score has risen while its position among 193 states has been unsteady (United Nations DESA, 2024). Our data are cross-sectional, so we cannot say that infrastructure causes the difference. People with better infrastructure may also be those with better access to markets and finance. The result is nonetheless in line with the conditions Zemouli et al. (2024) identify, infrastructure and training, as prerequisites for gains from digitalisation.

5.4 Financial readiness and service quality

Financial readiness has the strongest dimension-level association. Respondents whose organisations have digital budgets, financial capacity and a habit of assessing expected returns are those who report more diversification. This dimension is measured at the level of the respondent's organisation, so it may partly capture organisational resources in general. If the result holds in better data, it suggests that diversification effects depend on whether organisations can pay for digital projects, not only on the state's strategy. In the language of capabilities (Hidalgo & Hausmann, 2009), infrastructure, funding and skills are capabilities, while a strategy document is not.

The service-quality results tell a related story. Efficiency and cost reduction are rated most highly, so the benefits respondents see are mostly internal: cheaper and faster operations. Whether such gains turn into new products, exports or sectors, the changes that define diversification, is the step our data cannot observe.

5.5 What respondents credit digitalisation with

The ranking of the diversification items adds a further layer. Respondents most readily credit digitalisation with helping small firms reach new markets and with increasing the number of start-ups, both effects that operate through firms' ability to find customers and enter business at low cost. They credit it least with reducing dependence on hydrocarbons. This ordering is plausible. Digital tools can plausibly help a small firm sell more widely, but reducing a country's reliance on oil and gas requires that new activities grow large enough to matter for exports and public revenue, which takes time and sustained investment. The pattern suggests that respondents see digitalisation as a facilitator of early-stage diversification, the widening of the base described by Imbs and Wacziarg (2003), and not yet as a force that has shifted the economy's centre of gravity. This ordering resembles the macro picture drawn by Mokaddem et al. (2025), in which non-hydrocarbon activity grows inside the economy while the export base and the reliance on hydrocarbon revenue change far more slowly. The resemblance is suggestive only. Our items measure perceived effects of digitalisation and their indicators measure aggregate output and trade, so the two cannot be compared directly.

5.6 The rentier setting

A last point concerns the nature of the policy itself. Most announced projects target public administration (MEA Tech Watch, 2025), and the state remains both the main customer for digital services and the main source of funds. In such a setting digitalisation can improve how the existing system runs without changing what the economy produces. The survey cannot test this. It is, however, consistent with the moderate diversification ratings and with respondents crediting digitalisation more for efficiency than for structural change. It also echoes a concern in the resource-curse literature that rents can reduce the pressure to build competitive activity elsewhere (Auty, 1993). Mokaddem et al. (2025) likewise argue that whether rents become a lever for diversification depends on institutional quality and on the coherence of long-term policy. Digital policy that leaves those incentives untouched may deliver better administration without delivering a different economy.

5.7 Contribution to the literature

Three implications follow for the literature on digitalisation and diversification. First, treating digital transformation as a single construct hides the differences that matter. In our data the same overall index conceals dimensions that are rated very differently and relate very differently to the outcome. Studies that rely on a composite score, or on a single proxy such as mobile subscriptions, may therefore miss which part of digitalisation does the work. Second, the capabilities view of diversification (Hidalgo & Hausmann, 2009) gives a useful way to read the results: the dimensions most closely tied to perceived diversification, infrastructure, services and funding, are the ones that resemble productive capabilities, while the declaratory dimension is not. Third, the findings suggest that conditions identified in earlier Algerian work, notably infrastructure and training (Zemouli et al., 2024), are visible in the perceptions of users and not only in firm-level assessments. Taken together, these points support a more disaggregated approach in future work and a closer look at how organisations convert digital capacity into new economic activity.

5.8 Alternative explanations

Four alternative readings of the main result deserve attention. The first is a general response tendency: respondents who are positive about the state of the country may rate everything higher, which would produce a correlation between any two perception scales. We cannot rule this out with a single-source survey, although the fact that the dimensions differ so much in their association (R^2 from 0.09 to 0.44) is hard to square with a pure

response style, which would raise all of them similarly. The second is selection. The sample is dominated by university and public-sector respondents, who may be more exposed to digital systems and to official discourse about diversification than workers in small private firms. If so, the associations here may overstate those in the wider economy. The third is reverse causation. Respondents who observe new firms and activities around them may rate digital systems more favourably because they link those developments to digitalisation, and not the other way round. The fourth is omitted variables: education, sector, firm size or access to finance could drive both ratings. The group comparisons show no differences by education or sector, which offers some reassurance, but they cannot address unmeasured factors. None of these readings overturns the descriptive findings. Together they explain why we avoid causal language.

6. Policy implications

The results point to five priorities. They are inferences from perception data and should be treated as such.

The first is reliability before expansion. Platform stability and system integration were the weakest-rated items, and infrastructure was the lowest-rated dimension. Launching new platforms while existing ones fail often risks eroding the trust that later projects depend on. Making current systems stable and interoperable looks like the better first investment.

The second is communication. Respondents know less about the state's strategy than they believe in it. Explaining the strategy to firms, public employees and universities costs little compared with new infrastructure and addresses the gap between vision and experience directly.

The third is funding at organisational level. Because financial readiness showed the strongest association, public bodies could be given dedicated and protected digital budget lines, and small firms and start-ups easier access to finance for digital tools, so that digital projects do not stall for lack of resources.

The fourth is skills and support. Technical support was the weakest item in the service dimension, and the literature we reviewed repeatedly names human capital as a condition of success. Training for staff in firms and administrations belongs in the same plan as the equipment.

The fifth is outcome measurement. Current monitoring relies heavily on service-oriented indices such as the EGDI. Adding indicators closer to diversification itself, such as the share of firms selling online, digitally delivered service exports, the number of active digital start-ups and the weight of non-hydrocarbon exports, would let policymakers observe the contribution of digitalisation instead of inferring it from perceptions. Such indicators would also complement the aggregate measures of non-oil output and non-oil exports used by Mokaddem et al. (2025), linking digital capacity to the structural outcomes those measures track.

The priorities fall on different actors. For central government and the High Commission for Digitalisation, the main message concerns sequencing and communication: stabilise and integrate what exists, explain the strategy to its users, and publish outcome indicators. For public administrations and universities, which make up most of our sample, the findings point to protected digital budgets, technical support and training as the levers within their own control. For private firms and start-ups, whose voices are thinly represented here, the relevant question is whether the same bottlenecks (unstable platforms, weak integration, limited finance) also constrain them. The survey cannot answer it, but the financial readiness result suggests that access to funding for digital investment deserves attention. For researchers and statistical agencies, the implication is to build the data that would let such questions be answered, including firm-level surveys of digital adoption and regular measurement of digitally delivered services and exports.

7. Limitations and future research

Several limits constrain how far the findings can be pushed. The sample is small (124), drawn from one province, and non-probabilistic, with more than half the respondents from universities and research. Results may not generalise to firms, regions or less educated populations. Both scales are self-reported by the same people, which raises the risk of common-method bias, and the diversification items are partly worded as attributions to digitalisation, which builds some of the association into the measures. The regressions use one predictor at a time, so they cannot separate the dimensions from each other. The vision scale falls below the usual reliability benchmark, and no factor analysis was run to confirm the four-dimension structure. The design is cross-sectional, so no causal claim is warranted, and reverse causation is possible: respondents who see new economic activity around them may rate digital systems more favourably. Finally, the data measure perceptions of diversification, not diversification in output or exports.

Future work could address these limits in four ways. Probability samples across several provinces would improve representativeness. Multiple regression or structural equation models could estimate the dimensions jointly and test whether skills mediate the effects. Confirmatory factor analysis could check the dimensional structure. And pairing survey data with objective indicators, such as the composition of non-hydrocarbon exports, sectoral value added and firm-level digital adoption, would show whether the perceived links appear in actual economic structure.

Whether the pattern travels to other hydrocarbon-dependent economies is an open question. Countries differ in the size of their private sectors, the maturity of their digital infrastructure and the role of the state in procurement, all of which plausibly shape how digital investment translates into new activity. Comparative surveys using the same instrument in several resource-dependent economies would show whether the gap between declared vision and operational foundations is specific to Algeria or a general feature of rent-funded digital strategies.

8. Conclusion

This paper asked whether digital transformation is associated with economic diversification in Algeria as experienced by people inside the economy, and which parts of digital transformation carry the association. Survey data from 124 respondents in Mascara province give a consistent answer. Digital transformation and diversification are both rated as moderate. They are strongly associated, and every dimension of digital transformation is individually related to diversification. The strength of the relationship varies: infrastructure, service quality and financial readiness are closely linked to perceived diversification, while the strategic vision, though the most favourably rated element, is the least.

We read this as a case of latent potential. The digital agenda is accepted, but it has not yet been turned into the operational foundations that would convert it into structural change. For policymakers the implication is to put reliability, funding, skills and measurement alongside strategy. For researchers, the next step is to test the pattern with objective data and with designs that can separate cause from perception.

Three points deserve emphasis for readers who take only the headline findings. The association between digital transformation and perceived diversification is strong but cannot be read as a causal effect. The dimensions that behave like productive capabilities (infrastructure, services and funding) are those most closely tied to perceived diversification. And respondents credit digitalisation more with opening markets and creating firms than with reducing hydrocarbon dependence. Each of these is a hypothesis that objective data on firms and exports could now test.

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Appendix A. Questionnaire items

Items are translated from the Arabic original. All items use a five-point scale (1 = strongly disagree, 5 = strongly agree).

No.	Item
Strategic vision and economic support	
1	I have a clear knowledge of the state's digital transformation strategy.
2	The national vision for digital transformation gives clear importance to economic diversification.
3	There is effective communication between government and institutions to explain digitalisation policies.
4	Digitalisation is given priority in non-hydrocarbon sectors (agriculture, industry, services).
5	Digitalisation projects are geared toward innovation and the creation of new economic activities.
Infrastructure readiness and system stability	
6	Internet connection quality is sufficient to run digital services effectively.
7	National cloud data-centre provision is adequate to support digital transformation.
8	Government digital platforms run stably without frequent failures.
9	There is good integration between the digital systems of different administrations.
10	The level of digital security is sufficient to protect data and transactions.
Service quality and user experience	
11	Digital platform interfaces are easy to use and clear.
12	The response time of digital services is suitable.
13	The level of technical support is good and meets users' needs.
14	Digitalisation has actually reduced organisations' costs and procedures.
15	Digital services help organisations perform their work more efficiently.
Financial and economic readiness	
16	The organisation allocates an annual budget to digital transformation projects.
17	The organisation has the financial capacity to invest in modern digital solutions.

No.	Item
18	Expected financial returns from digitalisation are assessed before decisions are taken.
19	The organisation is prepared to bear the short-term costs of digital transformation.
Economic diversification	
20	Digital transformation has contributed to creating new jobs in technology and modern sectors.
21	Digitalisation has helped small and medium enterprises enter new local and international markets.
22	Digitalisation has contributed to developing exportable products and services.
23	Digital transformation has helped reduce dependence on hydrocarbons.
24	Digitalisation has raised productivity in agriculture, industry and services.
25	Digitalisation has increased the number of start-ups in technology and smart services.
26	Digital transformation has contributed to the emergence of new economic activities that did not exist before.