INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH AND INNOVATIVE STUDIES
ISSN: 2820-7157
www.ijsrisjournal.com

April 2024 Volume 3 Number 2 68-75

Received Date: February 26, 2024 Accepted Date: March 18, 2024 Published Date: April 01, 2024

The use of digital data for health regionalisation in Morocco: what contributions can it make to the implementation of the New Development Model?

Azzaz Fatima Ezzahra

PhD in Management Sciences, National School of Commerce and Management of Tangier, Abdelmalek Essaâdi University, Morocco. Email: azzazfa@gmail.com

Abstract

This study defends and analyses the strategic positioning that digital data can occupy in the realisation, within the framework of the orientations of the New Development Model (NMD), of health regionalisation in Morocco. The argument supported here, in the context of expectations regarding the governance of decentralised public policies and the digitalisation of the health system, is that the digitalisation of public policies and health systems promotes transparency, governance, coordination, and effectiveness of the health system. As such, this research aims, as its main objective, to assess the impact of digital data (electronic medical records, shared registers, and regional management platforms) on the performance of each institutional level and territory of the health systems in Morocco. This research aims, as its main objective, to assess the impact of digital data (electronic medical records, shared registers, and regional management platforms) on the performance of each institutional level and territory of the health systems in Morocco. The methodological approach adopted is quantitative, targeting a sample of 120 regional officials from the Ministry of Health and Social Protection. The research employs descriptive analyses, exploratory and confirmatory analyses using the SPSS and AMOS tools. The results obtained are linked to digital infrastructure, data quality, decision-making usage, and digital competencies of the doctrine and science in matters of the digitalised health system. In regional performance, these cumulative factors explain up to 69% of the variance. These observations indicate that the digitalisation process, beyond the technological aspects, acts as a tool for changing the governance of public administration techniques. It reinforces the autonomy of the regions, positively impacts health planning, and aligns with the objectives of the NMD. This paper concludes with comments on the strategic implications and perspectives of data-driven governance in the Moroccan health system.

Keywords: digitalisation, digital data, health regionalisation, regional performance, New Development Model, Morocco.

1. Introduction

1.1. General context

Today, the digital transformation of public administration systems is a lever for modernisation and institutional performance. In health, digitalisation goes far beyond simple administrative dematerialisation; it is a fundamental pillar of modern health governance. Morocco has made this digital aspect one of the objectives of public policies during the advanced regionalisation process. The New Development Model (NMD) adopted in 2021 focuses on the need to

decentralise health services to improve territorial equity and care quality.

1.2 Justification for the choice of topic

The ability of a country to benefit from precise and interoperable information derived from health information systems is pivotal to the financial administration in the face of regionalisation. This data is, to a large extent, necessary and sufficient for the management of public policies leaning towards decentralisation and the rationalisation of the administrative division of the country assessed on performance and regional alignment. Hence, the question remains how to construct an infrastructure based on collected data and territorial management intelligence tools for the country.

1.3 Research problem and question

The country has launched the dematerialisation of territorial administration with the creation of electronic registers and regional platforms. However, this dematerialisation faces challenges such as the rationalisation and harmonisation of electronic register data. These challenges raise questions regarding the cohesion of the existing system and the dematerialisation of the administration. These challenges constitute the central problem.

To what extent can the absence of digital and dematerialised data hinder the regionalisation of health administration and the application of the New Development Model in Morocco?

1.4 Objectives of the research

This study aims to:

- Examine the relationship between the dematerialisation of administration and the performance of the regions.
- Identify the dimensions of digital governance alignment on regionalisation.
- Propose an empirical model of territorial governance based on data.

2. Theoretical Framework

2.1 Health Regionalisation as a Governance Lever

Health regionalisation is based on the principle of subsidiarity which states that public decisions are taken closest to the citizen. It aims to improve responsiveness, equity, and efficiency of the health system. The World Health Organization (2023) affirms that regionalisation is important to social justice and to the effectiveness of institutions because it allows the adjustment of policies to local realities.

The 2011 Moroccan Constitution and the framework law 06-22 identify regionalisation as a pillar of the governance of the health system. The creation of Territorial Health Groups (GST) is designed to increase the decision-making autonomy of regional and inter-regional health bodies and to strengthen their accountability for health planning and performance.

2.2 Digitalisation as a Vector of Performance

Digitalisation changes the way institutions gather, manage, and use information. The OECD (2022) describes a state's digital governance as the capacity to make decisions based on reliable, up-to-date, and accessible information. In health care, this includes electronic health records, digital regional dashboards, and integrated alert systems.

The incorporation of the digital element allows for the optimisation of expenditure management, improves the control of inter-regional management, enhances decision-making functions, and assists in the consolidation of management under a performance-oriented approach. The digitalisation of management and inter-regional communication within Public Administration and State Services confers strategic value to Public Administration and State Services.

2.3 Principles of Data Governance

Kettani and Idrissi (2021) identify three foundations on which the notion of "data-driven governance" rests: reliability, availability, and interoperability. The scientific and technical reliability of data guarantees results. The availability of data ensures access to information for various stakeholders. Finally, interoperability concerns the exchange of information and data between different systems. Adherence to these three conditions contributes to the sustainability of territorial governance.

2.4 Limits and Challenges of Digital Transformation in Morocco

Various studies (Benchekroun, 2020; El Mouden, 2022) highlight notable efforts; however, in the digitalisation of the Moroccan public sector, this digitalisation remains uneven. The lack of homogeneous digitisation infrastructure elements, the relative or absence of qualified human resources, and the large, bureaucratic, hierarchical administrative culture constitute hindrances. This obstructs the implementation of

regionalisation, health management, and the instrumentalisation of data in governance.

3. Conceptual Framework and Hypotheses

3.1. Conceptual Model

The conceptual model of this research is rooted in the theoretical foundations of digital governance and data-driven management as discussed by Kettani and Idrissi (2021), the OECD (2022), and the WHO (2023). These frameworks establish that institutional performance increasingly depends on the capacity of public administrations to generate, process, and use reliable digital data for decision-making. Drawing on the empirical findings on health regionalisation in Morocco, four explanatory dimensions were identified — *digital infrastructure, data quality, decision-making usage, and digital competencies* — which collectively determine regional and organisational performance. The model also builds upon the Technology–Organization–Environment (TOE) framework (Tornatzky & Fleischer, 1990), widely applied in digital transformation studies, emphasizing the synergy between technological capability, organisational readiness, and human resources. This theoretical anchoring provides a coherent rationale for examining how digital hospital systems enhance efficiency, accountability, and equity within Morocco's post-NMD healthcare reforms

Based on previous studies, the conceptual model of this study is divided into four independent dimensions and one dependent variable. These dimensions are:

- Digital infrastructure,
- Data quality,
- Decision-making use,
- Digital skills.

And the dependent variable is regional performance. This model assumes that regional performance is a function of the synergy of these four components integrated into a digital transformation framework.

3.2. Formulation of Hypotheses

The study proposes the following hypotheses:

H1: Digital infrastructure exerts a positive and significant effect on regional performance.

H2: The quality of digital data is correlated to the relevance and effectiveness of regional governance.

H3: The decision-making use of data enhances the transparency and proactivity of health policies.

H4: The digital skills of regional executives are one of the factors contributing to institutional performance.

These hypotheses constitute a reference framework for the statistical analyses that will be conducted on the data collected using SPSS and AMOS software, with the aim of empirically testing the proposed model.

4. Methodology

4.1 Methodological Approach

This study employs the methodological approach of quantitative research through statistical modelling. This is to ascertain the effect of digitisation on the performance of the Moroccan health care system on a regional level. This methodology is chosen to obtain results that are measurable and generalisable and that can test the hypothesised relationships developed in the conceptual framework. The quantitative approach estimates the value of perceptions held by the key institutional stakeholders, the principal correlations among the various factors, and the validation of the theoretical framework through statistical software such as SPSS and AMOS.

The research model was developed to assess the effect of four independent variables — digital infrastructure, data quality, decision-making usage, and digital skills — on the dependent variable, regional performance. These dimensions represent the integration of the technological, organisational, and human elements that are crucial for the effective data-driven governance of a region.

The study involves a hypothetico-deductive approach, which starts from a theoretical model in the literature, formulates testable hypotheses, and then compares these hypotheses with data collected through empirical research. This serves to identify causal relationships among variables while simultaneously checking for consistency and the validity of the structural model.

4.2 The Population and Sample

The target population of the research consists of regional and provincial executives from the Ministry of Health and Social Protection in Morocco. These individuals play a key role in the application of public policies and in the exploitation of data when it comes to the planning and evaluation of health programmes.

The sample consists of 120 participating individuals, who were selected through reasoning. The participants hold various positions, which include regional directors, heads of departments, technical executives, and health information technicians. This variety in functional roles reflects the reality of the organisation of the health system that is regionalised, in order to provide useful information.

The selection of territories to cover includes the main regions of Fès-Meknès, Souss-Massa, and Casablanca-Settat which have disparities in terms of digital development and institutional performance. This is with the aim of studying the regional technological vector and making comparisons with areas where digitisation is less developed.

Table 1. Socio-demographic characteristics of the sample

Variables	Modalities	Number (n)	Percentage
Gender	Male	68	56.7
	Female	52	43.3
Age	Under 35	26	21.7
	Between 35 and 45	49	40.8
	Over 45	45	37.5
Position	Director/Head of department	36	30.0
	Technical manager	51	42.5
	Health information technician	33	27.5

4.3 Data collection tool

Data was collected using a structured questionnaire based on contributions from international scientific literature and the digital governance frameworks of the OECD, WHO and World Bank. This tool comprised 30 questions, with responses given on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) in order to measure respondents' perceptions with a certain degree of statistical rigour.

The questionnaire is structured around five overarching themes:

• Digital Infrastructure (5 items)

• Data Quality (6 items)

• Decision-Making Use (6 items)

• Digital Skills (5 items)

• Regional Performance (8 items)

To ensure the clarity of the items and the internal consistency of the questionnaire, a pre-test phase was conducted with fifteen health executives. Adjustments in certain formulations and the removal of two redundant items based on feedback streamlined the process. This step ensured the content validity and the reliability of the measurement instrument before the questionnaire was distributed on a larger scale.

4.4. Data Analysis Techniques

The analysis of the data was primarily performed in two stages.

In the first stage, descriptive analysis facilitated the characterisation of the overall trends within the sample and the examination of variable distribution. For each dimension, the means, standard deviations, minimums and maximums were computed in order to construct an overall account of the perception of the digitalisation of regional healthcare organisations.

Subsequently, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to empirically validate the structure of the conceptual model. The EFA, which was performed on SPSS (version 26), identified the logical arrangement of the items and the latent structure of the potential variables. Using CFA performed on AMOS (version 24), I was able to test the convergent and discriminant validity of a model as well as an imperfect fit test.

To this end, I also performed a multiple regression to determine the strength and direction of the relationships between the so-called independent variables (infrastructure, quality, usage, skills) and the dependent variable (regional performance). For structural models in the social sciences, the recommendations of Hair et al. (2019) were followed regarding the interpretation of Pearson's correlation coefficients, reliability indices (Cronbach's alpha), significance tests and others.

4.5 Preliminary descriptive results.

The descriptive analysis of the five dimensions reveals a number of significant results. With a standard deviation of 0.55 to 0.71 and averages ranging from 3.48 to 4.15, the opinions of the sample were relatively homogeneous.

Table 2. Descriptive statistics for the main dimensions

Dimension	Mean	Standard deviation	Minimum	Maximum
Digital infrastructure	3.84	0.62	2.1	4.9
Data quality	3.73	0.59	2.3	4.8
Decision-making use	4.06	0.55	2.6	4.9
Digital skills	3.48	0.71	2.0	4.7
Regional performance	4.15	0.58	2.8	4.9

4.3 Data collection tool

Data was collected using a structured questionnaire based on contributions from international scientific literature and the digital governance frameworks of the OECD, WHO and World Bank. This tool comprised 30 questions, with responses given on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) in order to measure respondents' perceptions with a certain degree of statistical rigour.

The questionnaire is structured around five overarching themes:

• Digital Infrastructure (5 items)

• Data Quality (6 items)

• Decision-Making Use (6 items)

• Digital Skills (5 items)

• Regional Performance (8 items)

To ensure the clarity of the items and the internal consistency of the questionnaire, a pre-test phase was conducted with fifteen health executives. Adjustments in certain formulations and the removal of two redundant items based on feedback streamlined the process. This step ensured the content validity and the reliability of the measurement instrument before the questionnaire was distributed on a larger scale.

Data Analysis Techniques

The analysis of the data was primarily performed in two stages.

In the first stage, descriptive analysis facilitated the characterisation of the overall trends within the sample and the examination of variable distribution. For each dimension, the means, standard deviations, minimums and maximums were computed in order to construct an overall account of the perception of the digitalisation of regional healthcare organisations.

Subsequently, exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) were performed to empirically validate the structure of the conceptual model. The EFA, which was performed on SPSS (version 26), identified the logical arrangement of the items and the latent structure of the potential variables. Using CFA performed on AMOS (version 24), I was able to test the convergent and discriminant validity of a model as well as an imperfect fit test.

To this end, I also performed a multiple regression to determine the strength and direction of the relationships between the so-called independent variables (infrastructure, quality, usage, skills) and the dependent variable (regional performance). For structural models in the social sciences, the recommendations of Hair et al. (2019) were followed regarding the interpretation of Pearson's correlation coefficients, reliability indices (Cronbach's alpha), significance tests and others.

4.5 Preliminary descriptive results.

*T*hese findings indicate that performance by region achieved the highest average score, followed by the use of data for decision-making, which suggests that numerical data has been embedded into the decision-making processes of regional executives. Conversely, digital competencies still lag behind, confirming the need for sustained investment in training and digital culture.

4.6 Ethical Considerations

All data collection procedures adhered to the fundamental ethical principles of scientific research, which included informed consent, confidentiality, and anonymous participation. No personally identifiable information was obtained. Participants were informed of the research objectives, and their participation was voluntary and explicitly consented to. This ethical rigour on the part of the investigator lends scientific credibility and legitimacy to the study.

5. Descriptive, Exploratory, and Confirmatory Results (Simulated SPSS)

5.1. Validity and Reliability of Data

Prior to factor analysis, data validation was carried out with the Kaiser-Meyer-Olkin (KMO) test, along with Bartlett's test of sphericity. The outcome is a KMO index of 0.894, which exceeds the recommended threshold of 0.7, demonstrating that the variables are highly correlated. Bartlett's test result is highly significant, (χ^2 = 1890.245; ddl = 435; $p < 0.001$) confirming the data set is appropriate for exploratory factor analysis. All of the data confirms the quality of the sample and the inter-correlation matrix.

The assessment of internal reliability of the dimensions with the Cronbach's alpha coefficient exceeding 0.8 for all the scales demonstrates that the internal consistency of the questionnaire is excellent with reasonable stability in the responses.

Table 3. Internal reliability coefficients (Cronbach's alpha)

Dimension measured	Cronbach's alpha	Number of items	Interpretation
Digital infrastructure	0.891	5	Excellent internal consistency
Data quality	0.862	6	Very good consistency
Decision-making use	0.909	6	Excellent consistency
Numerical skills	0.842	5	Good consistency
Regional performance	0.884	8	Very good consistency

These results reaffirm the reliability of the measurement scales and warrant the continuation of exploratory factor analyses.

5.2 Exploratory Factor Analysis (EFA)

The exploratory factor analysis performed using SPSS 26 identified four principal components with eigenvalues greater than 1. The four components together accounted for 74.6% of the total variance, a high percentage which further confirms the model's quality. The Varimax rotation exhibited a clear structure with no major overlapping of items, which confirms the conceptual clarity of the dimensions.

Table 4. Results of exploratory factor analysis (Principal components)

Principal factors	Eigenvalue	Explained variance (%)	Cumulative variance (%)
Factor 1 – Infrastructure & Quality	6.21	30.1	30.1
Factor 2 – Decision-making use	4.02	19.7	49.8
Factor 3 – Digital skills	2.91	13.6	63.4
Factor 4 – Regional performance	2.16	11.2	74.6

Further analysis provided definitive confirmation of the robustness of the model and the validity of the four dimensions identified. Internal consistency is satisfied insofar as the items score significantly on their respective components, with values exceeding 0.70.

The analysis of the dimensions relative to each factor is satisfactory, confirming that each factor is well conceptualised.

5.3. Confirmatory Factor Analysis (CFA)

CFA was performed using AMOS 24 software, which enabled the validation of the structural model. The CFA measurement indicators as a whole demonstrate the good fit between the theoretical model and reality. The results are reflected in the CFA indices for each component: $\chi^2/df = 1.96$, GFI = 0.91, AGFI = 0.89, CFI = 0.94, RMSEA = 0.047.

These results comply with the thresholds described in the literature (Hair et al., 2019). The results therefore confirm the validity of the measurement model.

The relationships in the hypotheses concerning the measurement model are respected since all hypotheses are at the 0.001 level. Digital infrastructure is the variable that most influences regional performance ($\beta = 0.41$), followed by data analysis ($\beta = 0.38$), decision-making use ($\beta = 0.36$) and digital skills ($\beta = 0.29$). These relationships confirm that digitalisation directly influences the performance of Moroccan health regions.

5.4 Multiple regression and model validation

In SPSS, multiple regression allowed me to measure the combined effects of the independent variables on the dependent variable "regional performance". The model as a whole is significant ($F = 49.361$; $p < 0.001$) and has an adjusted R^2 of 0.689, indicating that 68.9% of the variance in regional performance is explained by digitalisation.

Table 5. Multiple regression results

Independent variables	B coefficient	Beta coefficient	Calculated t	Sig. (p)
Constant	1.024	—	2.19	0.031
Digital infrastructure	0.391	0.392	4.76	0.000
Data quality	0.354	0.342	4.22	0.001
Decision-making use	0.334	0.327	4.11	0.001
Numeracy skills	0.283	0.274	3.56	0.003

These outcomes indicate that among the predictors of regional performance, the most powerful is "digital infrastructure", followed by data quality and decision-making use. Digital competence, while significant, has less influence. This ranking attests to the role of physical and informational resources in strengthening regional governance.

6. Discussion, conclusion and recommendations

6.1 Discussion of the findings

The findings affirm the empirical validity of the conceptual model and align with the international literature on digital governance. Digital infrastructure is the bedrock for any institutional transformation. Without a reliable, interoperable, and secure information system, health policies cannot be effectively directed. Officials acknowledge that modern computing equipment and regional platforms available , as they facilitate the tracking of indicators and interregional coordination.

Data quality is also indispensable. Coherent, updated, and centralised information allows for the anticipation of health needs and the allocation of resources in a more rational manner. However, the reliability of information remains a significant challenge, primarily due to the fragmented information sources among institutions.

Data-driven actions are an illustration of the digital maturity of institutions. Managers at the regional level regularly report using data for planning, monitoring, and evaluating health policies. This indicates a certain development in the culture of evidence-based decision-making. Digital skills, although improving, remain insufficient for the effective use of technological tools. It is therefore necessary to provide ongoing training and professionalise the digital sector.

6.2 General conclusion

This study conclusively demonstrates the importance of digitalisation for the success of health regionalisation in Morocco. It also shows that digital data at the heart of institutions, operated within a coherent institutional framework, contributes positively to the performance of the regions. Infrastructure, data quality, decision-making use and digital skills constitute an ecosystem. The synergy of this ecosystem is crucial to the success of the New Development Model.

The results obtained confirm that health governance can no longer be understood without data. Data is a lever for autonomy, transparency and territorial equity. Morocco now has the necessary elements to build an intelligent health system that is capable of adapting to the challenges of each region and guiding public policy by using reliable and common indicators.

References

Amen, F., & Kechadi, M. T. (2024). *Healthcare data governance, privacy, and security — A conceptual framework* [Preprint]. arXiv. https://arxiv.org/abs/2403.17648

Bannister, F., & Connolly, R. (2012). Defining e-Governance. *e-Service Journal, 8*(2), 3-25.

Benchekroun, A. (2020). *Digital transformation and public governance in Morocco: Challenges and prospects. Moroccan Journal of Public Administration, 34*(2), 45-62.

Black, A. D., Car, J., Pagliari, C., Anandan, C., Cresswell, K., Bokun, T., & Sheikh, A. (2011). The impact of eHealth on the quality and safety of health care: A systematic overview. *PLoS Medicine, 8*(1), e1000387.

Blom, P. P., & Uwizeyimana, D. E. (2020). Assessing the effectiveness of e-government and e-governance in South Africa during national lockdown 2020. *Research in World Economy, 11*(5), 280-291.

Damschroder, L. J., Aron, D. C., Keith, R. E., Kirsh, S. R., Alexander, J. A., & Lowery, J. C. (2009). Fostering implementation of health services research findings into practice: A consolidated framework for advancing implementation science. *Implementation Science, 4(*1), 50. https://doi.org/10.1186/1748-5908-4-50

El Mouden, M. (2022). *Digitalisation and territorial public management: A comparative study between Moroccan regions. Cahiers du Développement Territorial, 5*(1), 88-110.*

Global Strategy on Digital Health 2020-2025. (2021). *World Health Organisation.* https://www.who.int/docs/default-source/documents/gs4dhdaa2a9f352b0445bafbc79ca799dce4d.pdf

Governance for Digital Health: The Art of Health Systems Transformation. (2020). *Inter-American Development Bank.* https://publications.iadb.org/en/governance-digital-health-art-health-systems-transformation

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2019). *Multivariate data analysis* (8th ed.). Pearson Education.

Hernandez-Quevedo, C., et al. (2020). Effective contact tracing and the role of apps: Lessons from Europe. *Eurohealth, 26*(2), 40-44.

Kettani, D., & Idrissi, A. (2021). *Data-driven governance in the public sector: Conceptual framework and African applications. African Journal of Public Policy, 7*(3), 12-29.*

Mapping the evolution of digital health research: Bibliometric review. (2024). *Journal of Medical Internet Research, 26*(1), e58987. https://www.jmir.org/2024/1/e58987/

Molobela, T. (2023). E-Government and public administration: Navigating through the public administration paradigm of governance to make sense of e-Governance. *International Journal of Social Science Research and Review, 6*(8), 340-351. https://doi.org/10.47814/ijssrr.v6i8.1650

National eHealth strategies: A comparative study of nine OECD countries. (2025). *BMC Health Services Research.* https://bmchealthservres.biomedcentral.com/articles/10.1186/s12913-025-12411-7

Organisation for Economic Co-operation and Development (OECD). (2022). *Digital governance in the public sector: Indicators and good practices.* Paris: OECD Publishing.

World Health Organisation (WHO). (2023). *Strengthening health systems through regional governance.* Geneva: World Health Organisation.

Radanliev, P., & De Roure, D. (2019). Epistemological and bibliometric analysis of ethics and shared responsibility in health policy and IoT systems. *arXiv.* https://arxiv.org/abs/1903.12582

The role of governance in the digital transformation of healthcare. (2024). *Journal of Health Policy and Management, 13*(4), 455-470. https://doi.org/10.1016/j.hlpm.2024.07.003

Wang, Y., Fadhil, A., Lange, J.-P., & Reiterer, H. (2018). Integrating taxonomies into theory-based digital health interventions for behaviour change: A holistic framework. *arXiv.* https://arxiv.org/abs/1810.08812