



Received: 07-01-2026
Accepted: 17-02-2026

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Provincial Digital Transformation in Vietnam: A Stocktaking Through the Digital Transformation Index and Policy Implications

Nguyen Ngoc Quynh Anh

Hanoi University of Natural Resources and Environment, Vietnam

DOI: <https://doi.org/10.62225/2583049X.2026.6.1.6680>

Corresponding Author: Nguyen Ngoc Quynh Anh

Abstract

This paper examines the state of provincial digital transformation in Vietnam between 2020 and 2024 using the Digital Transformation Index (DTI), published annually by the Ministry of Information and Communications and, since 2025, by the Ministry of Science and Technology. Drawing on descriptive statistics, year-on-year comparison and an analysis of the index architecture, the study reports four findings. First, the mean provincial DTI rose from 0.3026 in 2020 to 0.6961 in 2024, yet annual growth fell sharply from 32.7 per cent in 2021 to 2.6 per cent in 2024, indicating that the current index is approaching saturation. Second, the locus of growth has shifted from the digital government pillar towards the digital economy and digital society pillars, which overtook it in 2024. Third, disparities across

provinces have narrowed markedly in the foundational sub-indices but remain wide in the activity sub-indices, most notably digital society activity, where the 2023 value stood at 0.4181 while fifteen provinces achieved the maximum score for digital awareness. Fourth, year-on-year comparability is constrained both by successive revisions of the index and by the provincial administrative merger that took effect on 1 July 2025, which reduced the number of provincial units from 63 to 34. On this basis, the paper advances five sets of policy implications, centred on shifting measurement from implementation towards final outcomes, prioritising the skills and usage layers of the digital divide, and re-establishing the DTI data series after the merger.

Keywords: Digital Transformation, Digital Transformation Index, Digital Government, Digital Divide, Subnational Government, Vietnam

1. Introduction

Digital transformation has been a central development priority for Vietnam for more than half a decade. Politburo Resolution No. 52-NQ/TW of 27 September 2019 on proactive participation in the Fourth Industrial Revolution laid the political foundation for this agenda. Prime Ministerial Decision No. 749/QĐ-TTg of 3 June 2020, which approved the National Digital Transformation Programme to 2025 with orientations to 2030, established the three-pillar model of digital government, digital economy and digital society that continues to structure policy today. Two sectoral strategies subsequently operationalised the pillars with quantified targets: Decision No. 942/QĐ-TTg of 15 June 2021 on developing e-government towards digital government, and Decision No. 411/QĐ-TTg of 31 March 2022 on the national strategy for the digital economy and digital society. Most recently, Politburo Resolution No. 57-NQ/TW of 22 December 2024 elevated science, technology, innovation and digital transformation to the status of a strategic breakthrough for the next development phase.

Within this policy architecture, the provincial level occupies a pivotal position. Provincial governments deliver the majority of public services to citizens and firms, fund local digital infrastructure, and mediate between national targets and grassroots implementation. Questions about where provincial digital transformation currently stands, in which direction it is moving and where it is constrained therefore have immediate consequences for the allocation of public resources.

Since 2020, the Ministry of Information and Communications, which was merged into the Ministry of Science and Technology in March 2025, has constructed and published the DTI annually at three levels: national, ministerial and provincial. After five publication rounds, the DTI constitutes a comparatively long, structurally explicit data series covering every province. It is one of the few publicly available sources that permits a systematic description of subnational digital transformation in Vietnam. Most reporting on the index, however, takes the form of an annual league table that foregrounds individual provincial rankings, while analytically prominent questions receive little systematic treatment: the trajectory of the provincial cohort as a whole, the

shifting balance among the three pillars, the extent to which inter-provincial gaps are closing, and the limitations of the instrument itself.

This paper addresses part of that gap. Its objective is to describe and interpret the state of provincial digital transformation in Vietnam over 2020–2024 through DTI data, guided by three questions. First, how have the provincial DTI and each of its pillars evolved over the study period? Second, are inter-provincial disparities narrowing or widening, and in which groups of sub-indices? Third, which measurement limitations must be taken into account when the DTI is used as a basis for policy?

The contribution is threefold. First, the paper compiles and presents five consecutive years of provincial DTI data together with the three constituent pillars, rather than a single publication round. Second, it reads these data through a multi-layered conception of the digital divide, which makes it possible to separate progress attributable to foundational conditions from progress attributable to actual use. Third, it discusses explicitly the intrinsic limitations of the DTI as a largely self-reported composite indicator, together with the consequences of the administrative merger for the continuity of the series — an issue that will condition any quantitative work using the DTI in the coming years.

2. Conceptual Framework and Literature Review

2.1 Digital Transformation and its Public-Sector Variant

The international literature distinguishes digital transformation from digitization, understood as the conversion of analogue data into digital form, and from digitalization, understood as the use of digital technology to improve existing processes. Reviewing more than two hundred studies, Vial (2019) characterises digital transformation as a process in which digital technologies alter the way an organisation creates value, thereby entailing changes in structure, capabilities and stakeholder relations. Verhoef *et al.* (2021) ^[18] likewise emphasise the sequential nature of the process, in which the business model is genuinely reconfigured only at the final stage.

For the public sector, Mergel, Edelman and Haug (2019) ^[3] draw on expert interviews to argue that digital transformation in public administration extends beyond moving services online to encompass changes in organisational culture, internal processes and relations with citizens. Short-term outputs may be measured by the number of new digital services, whereas long-term results must be assessed in terms of governance effectiveness and citizen satisfaction. This distinction bears directly on the interpretation of the DTI: an index that measures the degree of implementation does not thereby measure transformation outcomes.

At a different level of analysis, digital divide theory provides a framework for interpreting disparities across territorial units. Van Dijk (2006) ^[17] distinguishes four successive layers of access — motivational, material, skills and usage — and argues that once infrastructure and devices become widely diffused, inequality does not disappear but migrates to the higher layers, namely skills and meaningful use. This is a productive lens through which to read Vietnamese DTI data for 2020–2024.

2.2 Measuring digital transformation with composite indicators

Composite indicators are a standard instrument for comparing development levels across administrative units. At the international level, the United Nations E-Government Development Index is the leading example; in the most recent survey Vietnam ranked 71st of 193 countries, an improvement of fifteen places on the previous round. The methodological literature on composite indicators, notably the handbook issued by the OECD and the European Commission Joint Research Centre (OECD & JRC, 2008), nevertheless cautions against several systematic risks: the selection of sub-indicators and the assignment of weights always embody value judgements; aggregation can conceal substantively important internal variation; and where a composite is used to rank, the entities assessed acquire an incentive to optimise against the indicator rather than against the underlying objective.

These caveats do not diminish the value of the DTI, but they do impose a requirement to read its results structurally — distinguishing sub-indices on which maximum scores are readily attainable from those that capture actual behaviour — rather than reading the aggregate score and the ranking alone.

2.3 The provincial DTI: Architecture and successive revisions

The DTI framework was introduced in 2020 and subsequently re-approved by Decision No. 922/QĐ-BTTTT of 20 May 2022 issued by the Minister of Information and Communications. The provincial DTI is organised around the three pillars of digital government, digital economy and digital society, with its main sub-indices grouped into two sets: a foundational set comprising digital awareness, digital institutions, digital infrastructure, digital human resources and cybersecurity, and an activity set comprising digital government activity, digital economy activity and digital society activity.

The number of component indicators has varied between rounds. In the 2023 round the provincial DTI comprised nine main sub-indices and 98 component indicators, with the smart-city sub-index excluded from the provincial score. In the 2024 round the architecture was streamlined to eight main sub-indices and 47 component indicators. Data are collected and assessed online through the dti.gov.vn platform, combining automated measurement with verified statistical reporting; the share of automatically measured indicators is 20 per cent at provincial level, 22.6 per cent at ministerial level and 33 per cent at national level. On 3 April 2025 the Ministry of Science and Technology issued Decision No. 405/QĐ-BKHCN, revising the framework so as to assess the final outcomes of digital transformation and to align more closely with international assessment criteria.

2.4 Research on provincial digital transformation in Vietnam

A number of Vietnamese studies have used subnational index data to analyse digital transformation. Dang (2022) ^[2] examines public-sector digital transformation in the Mekong Delta and identifies a paradox between the rapid increase in

the availability of level-3 and level-4 online public services and the comparatively low share of citizens who actually use them — an early manifestation of the gap between the supply of and demand for digital services. Dang (2024) ^[1] combines the DTI with GRDP, the e-business index, the Provincial Competitiveness Index and the Provincial Governance and Public Administration Performance Index to assess the digital maturity of seven major cities, and emphasises the role of managerial capability alongside technical capability.

Both studies concentrate on a single region or a purposively selected group of localities and draw on one or two rounds of DTI data. The gap this paper addresses is a description covering the entire provincial cohort across all five publication rounds, accompanied by an explicit assessment of the comparability of the series.

3. Data and Methods

3.1 Data Sources

The study uses secondary data from the annual DTI reports of the Ministry of Information and Communications (rounds 2020, 2021, 2022 and 2023) and of the Ministry of Science and Technology (round 2024), released through the responsible agency's portal and the dti.gov.vn platform. The variables used are: the mean provincial DTI and the national DTI by year; the mean value of the three provincial pillars by year; the scores and ranks of the leading provinces; the share of provinces exceeding the midpoint of 0.5; and the values of selected main sub-indices that function as bottlenecks. The 2025 round had not been published at the time of writing, so 2024 is the most recent round available.

The mean provincial DTI and the national DTI for 2022 are not stated directly in the sources consulted; they have been derived from the 2023 values and the corresponding growth rates published by the responsible agency. Derived values are flagged in the tables and are used only to describe the trend, not for precise computation.

3.2 Methods

Three analytical operations are performed. The first is descriptive statistics and year-on-year comparison, used to establish the trajectory of the mean provincial DTI, the national DTI and each pillar, together with annual growth rates. The second is structural analysis, in which the values of the foundational sub-indices are set against those of the activity sub-indices in order to locate bottlenecks. The third is dispersion analysis, which uses the share of provinces above the 0.5 threshold and the volatility of ranks among leading provinces as indirect indicators of convergence.

This is a descriptive and interpretive study; it does not test causal relationships. Statements about causes are presented as evidence-based readings of the data situated within the framework set out in Section 2, not as statistical conclusions.

3.3 Data Limitations

Three limitations should be stated before the results are presented. First, the architecture of the index has changed between rounds, so movements in scores and ranks between adjacent years do not fully reflect substantive change. Second, 80 per cent of provincial indicators rest on reported data, so data quality depends on the reporting capacity and diligence of each province. Third, from 1 July 2025 the number of provincial-level units fell from 63 to 34, which

fundamentally alters the unit of observation for the series.

4. The state of provincial digital transformation, 2020–2024

4.1 Overall trajectory: Rapid growth followed by a plateau

The mean provincial DTI increased continuously throughout the period, from 0.3026 in 2020 to 0.6961 in 2024, roughly a 2.3-fold increase over four years (Table 1). The shape of the increase, however, is more informative than its magnitude: growth reached 32.7 per cent in 2021, remained high in 2022, fell to 17.2 per cent in 2023 and stood at only 2.6 per cent in 2024. This pattern suggests that the phase of growth driven by the completion of foundational conditions — issuing regulations, establishing steering committees, extending infrastructure coverage and moving public services online — has largely run its course, and that the existing index is approaching saturation.

Table 1: Mean provincial DTI and national DTI, 2020–2024

Year	Provincial DTI (mean)	Growth on previous year	National DTI
2020	0.3026	–	0.4858
2021	0.4014	+32.7%	0.6110
2022	0.5786 (*)	+44.1% (*)	0.7112 (*)
2023	0.6783	+17.2%	0.7326
2024	0.6961	+2.6%	0.7955

Source: compiled from DTI reports of the Ministry of Information and Communications (2022, 2025) and the Ministry of Science and Technology (2025). (*) Derived from the 2023 value and the published growth rate.

The national DTI exceeds the mean provincial DTI throughout the period. This difference is structural: the national index measures the degree to which national digital transformation targets have been met, including the contribution of systems and platforms deployed centrally, whereas the provincial index averages the implementation capacity of individual provinces. The two cannot therefore be used interchangeably when assessing the capacity of subnational government.

A further indicator of diffusion is the share of provinces above the midpoint of 0.5. In 2021 only 9.52 per cent of provinces exceeded this level; by 2022 the share had risen to 84.1 per cent; and by 2023 all 63 provinces had done so. Provincial digital transformation has thus moved from a state of pronounced differentiation in start-up conditions to one in which every province has passed the start-up threshold — which in turn deprives the 0.5 benchmark of its discriminating power.

4.2 The three pillars: From government-led to economy- and society-led growth

Table 2 documents a notable shift in the locus of growth. In the first two rounds all three pillars stood below 0.5, with digital government consistently ahead (0.3611 in 2020 and 0.4317 in 2021) and digital economy lowest in 2020 (0.2568). In the 2023 round digital government still recorded the highest value (0.7240) and digital society the lowest (0.6783). In the 2024 round, however, the ordering reversed: digital economy reached 0.7723 and digital society 0.7692, both above digital government at 0.7582. Growth rates point in the same direction: 13.3 per cent for digital economy and 13.4 per cent for digital society, against 4.7 per cent for digital government.

Table 2: Mean values of the three provincial DTI pillars, 2020–2024

Pillar	2020	2021	2022	2023	2024
Digital government	0.3611	0.4317	0.6467	0.7240	0.7582
Digital economy	0.2568	0.4098	0.6395	0.6817	0.7723
Digital society	0.2898	0.3989	0.5739	0.6783	0.7692

Source: compiled from provincial DTI reports of the Ministry of Information and Communications and the Ministry of Science and Technology, rounds 2021, 2023 and 2024.

Two readings of this pattern are available, and they are not mutually exclusive. The first is substantive: after a phase in which the public sector moved first to build infrastructure and institutions, digital transformation has diffused into the business sector and everyday life, in line with the sequence envisaged by the National Digital Transformation Programme. The second is technical: the digital government pillar has reached the ceiling of the measurement scale on many component indicators and therefore has little headroom left, whereas the other two pillars started from a lower base and consequently grow faster. Adjudicating between the two mechanisms would require disaggregated component data, which are not currently published in open format.

4.3 Leading provinces and rank volatility

In the 2023 round Da Nang scored 0.8340 and held first place for the fourth consecutive year, leading on five of the eight main sub-indices. The ten leading provinces were Da Nang, Ho Chi Minh City, Thua Thien Hue, Lang Son, Can Tho, Hanoi, Binh Duong, Hai Phong, Bac Giang and Ba Ria – Vung Tau; seven retained their position from the previous round and three entered the group for the first time, namely Hanoi, Binh Duong and Hai Phong. Hanoi scored 0.7448, rising eighteen places on the 2022 round to sixth position.

In the 2024 round the composition of the leading group changed appreciably: Hanoi moved to first place with 0.8241 and led on four of the eight main sub-indices, followed by Hue, Hai Phong (0.7857), Ho Chi Minh City and Thanh Hoa (0.7742). Thanh Hoa is a case of particular interest because its pillar scores are comparatively even — 0.8668 for digital government, 0.8836 for digital economy and 0.8627 for digital society — indicating that membership of the leading group is no longer confined to the largest metropolitan areas.

Table 3: Leading provinces in the provincial DTI, rounds 2023 and 2024

Rank	Round 2023	Score	Round 2024	Score
1	Da Nang	0.8340	Hanoi	0.8241
2	Ho Chi Minh City	n/a	Hue	n/a
3	Thua Thien Hue	n/a	Hai Phong	0.7857
4	Lang Son	0.7601	Ho Chi Minh City	n/a
5	Can Tho	n/a	Thanh Hoa	0.7742
6	Hanoi	0.7448	—	—

Source: provincial DTI report for round 2023 (Ministry of Information and Communications) and round 2024 (Ministry of Science and Technology). n/a indicates that the score is not stated in the published sources consulted; no substitute value has been imputed.

The magnitude of rank movement between consecutive rounds warrants cautious interpretation. A province rising eighteen places in a single year, or a province that led for four consecutive rounds losing first place, cannot plausibly

be explained solely by substantive change in digital transformation capacity over twelve months. Several factors are likely to operate jointly: revision of the index architecture between rounds, changes in the scoring of particular component indicators, and improvements in the compilation and verification of reported data. DTI ranks are therefore better treated as a reference signal than as a measure of performance in any given year.

4.4 The bottleneck: Foundational versus activity sub-indices

Structural analysis reveals what is arguably the most important feature of the current situation. In the 2023 round, digital awareness recorded the highest value among the main sub-indices, with fifteen provinces attaining the maximum score, and digital institutions ranked second with six provinces at the maximum; the lowest-scoring main sub-index, by contrast, was digital society activity at 0.4181. The distance between these two poles is large and diagnostically significant: sub-indices that depend on actions of the administrative apparatus — issuing resolutions and plans, organising training — are close to their ceiling, whereas those that depend on the actual behaviour of citizens in digital environments remain low.

This bottleneck is not new. As early as the 2021 round, the two lowest-scoring sub-indices for the provincial cohort were digital human resources (0.2424) and cybersecurity (0.3267), which the responsible agency identified as prerequisites requiring early attention. National data for the 2024 round reproduce the same pattern at a higher level: 79.7 per cent of the population aged 14 and over holds a digital identity usable for electronic transactions, whereas only 21.96 per cent of the same age group holds a personal digital certificate and 47.62 per cent are assessed as possessing information and communication technology skills. Even in Hanoi, the leading province, the corresponding figures are 85.17 per cent, 35.57 per cent and 61.25 per cent, leaving a substantial shortfall on the latter two.

Read through van Dijk's (2006) ^[17] framework, Vietnam has been comparatively successful in addressing the material access layer: telecommunications infrastructure is extensive and the electronic identity system now reaches most of the adult population. The current bottleneck lies in the skills and usage layers — precisely the layers that infrastructure investment cannot easily reach, and precisely those that the existing index captures least well.

4.5 Comparability of the series after the administrative merger

With effect from 1 July 2025, Vietnam reorganised its administrative units, reducing the number of provinces and centrally governed cities from 63 to 34. Because the 2024 round draws on data for 2024, when the merger had not yet occurred, the responsible agency published two parallel sets of results: one for the 63 pre-merger units and one for the 34 post-merger units. For the latter, the DTI of each new province is calculated as the arithmetic mean of the main sub-indices of its constituent pre-merger provinces.

This treatment is technically defensible as a means of maintaining consistency in publication, but its nature should be understood correctly: it is a data-splicing device and does not represent the actual digital transformation status of the new administrative unit. In practice, merging two or three

administrations entails the costs of integrating information systems, standardising data, consolidating processes and retraining staff — factors that may temporarily depress rather than raise the index. Averaging also obscures intra-provincial disparity: a new province formed from one high-scoring and one low-scoring predecessor will appear with a mean value that conceals exactly the problem policy needs to see.

The methodological implication is clear. The DTI series up to 2024 and the series from 2025 onwards should be treated as two distinct series, or else reconnected by recomputing all component indicators retrospectively on the new administrative boundaries. The revision of the framework under Decision No. 405/QĐ-BKHCN further increases the discontinuity at the point of transition.

5. Discussion

First, the fall in provincial DTI growth to 2.6 per cent in 2024 is better read as a sign of phase transition than as evidence of diminished effort. Once most provinces score highly on the foundational sub-indices, the index progressively loses discriminating power and ceases to register additional effort. This is precisely the rationale for the responsible agency's own decision to revise the framework towards the measurement of final outcomes rather than degrees of implementation.

Second, the gap between the foundational and the activity sub-indices is the finding with the greatest policy relevance. It corroborates the argument of Mergel *et al.* (2019) ^[3] that the short-term outputs of public-sector digital transformation are easy to measure and easy to achieve, whereas long-term results — changes in behaviour, governance effectiveness and citizen satisfaction — are both harder to measure and slower to materialise. The finding is also consistent with Dang's (2022) ^[2] observation of a gap between the availability of online public services and the extent of their actual use.

Third, the convergence pattern in the data is one of convergence at the foundational layer accompanied by persistent divergence at the usage layer. All provinces passed the 0.5 threshold from the 2023 round onwards, yet the distance between the leading province and the mean remains considerable: in the 2024 round the leader scored 0.8241 against a mean of 0.6961. This accords with the central proposition of digital divide theory: as material access becomes universal, inequality does not dissipate but shifts to the skills and usage layers (van Dijk, 2006) ^[17].

Fourth, the intrinsic limitations of the DTI should be acknowledged when it informs policy. With 80 per cent of provincial indicators resting on reported data, the index is exposed to self-reporting bias. Because it is published as a league table and because many provinces incorporate rank improvement into their own plans, it is also exposed to the incentive distortion against which the composite-indicator literature warns (OECD & JRC, 2008): optimisation against the indicator rather than the objective. Raising the share of automatically measured indicators — currently 20 per cent at provincial level — is the most direct remedy for the first of these risks.

6. Policy Implications

Five sets of implications follow from the findings above.

First, shift the focus of measurement from implementation to final outcomes. The revision mandated

by Decision No. 405/QĐ-BKHCN moves in the right direction and should be operationalised through indicators that resist formalistic compliance: the share of applications processed fully online as a proportion of all applications received, actual processing time relative to statutory deadlines, the share of applications requiring supplementary submissions, user satisfaction with services, and the contribution of the digital economy to GRDP. In parallel, the share of automatically measured indicators at provincial level should be raised substantially above the current 20 per cent, giving priority to indicators that can be extracted directly from administrative-procedure information systems and shared national platforms.

Second, prioritise resources for the skills and usage layers. The data indicate that the bottleneck no longer lies in infrastructure or digital identity but in skills and actual use. Digital skills programmes should accordingly be located at commune level, aligned with the two-tier local government model, and provided with dedicated targets and funding rather than embedded in general tasks. Rural populations, older people and informal-sector workers warrant priority attention, since these are the groups least represented in the digital society activity indicators.

Third, re-establish the DTI series after the administrative merger. The responsible agency should either recompute all component indicators for 2020–2024 on the basis of the 34 new administrative units, or state explicitly that 2025 constitutes the base year of a new series. To prevent arithmetic averaging from concealing intra-provincial disparity, an indicator of internal evenness — for example the dispersion of results across communes within each province — should also be added.

Fourth, use the DTI as a diagnostic instrument rather than a performance league table. Because DTI ranks are sensitive to methodological revision and to reporting quality, tying ranks to performance appraisal creates incentives for formalistic optimisation. A more productive use is to exploit the structure of the eight main sub-indices to diagnose each province's specific weaknesses, and to read the DTI alongside complementary indices such as the Provincial Competitiveness Index, the Provincial Governance and Public Administration Performance Index and the Provincial Innovation Index in order to obtain a multidimensional assessment.

Fifth, open the component-level data. DTI data are currently released mainly as reports and rankings. Publishing component indicators in open, machine-readable form as a complete time series would allow the research community to conduct independent verification, to detect anomalies in reported data and to undertake more rigorous quantitative analysis — thereby functioning as a quality-control mechanism for the index itself.

7. Conclusion

Across five publication rounds, DTI data indicate that provincial digital transformation in Vietnam has completed a foundation-building phase with tangible results: the mean provincial DTI rose from 0.3026 to 0.6961 in four years, every province exceeded the midpoint from the 2023 round onwards, and the locus of growth has shifted from the digital government pillar to the digital economy and digital society pillars. The same data also expose three problems: growth has plateaued as the index approaches saturation; a persistent gap separates foundational sub-indices near their

ceiling from activity sub-indices that remain low; and the series has been disrupted by both the revision of the framework and the reorganisation of provincial administrative units.

The overarching implication is that the coming period requires a twofold shift: in policy, from building conditions to generating actual use; and in measurement, from degrees of implementation to final outcomes. The two are interdependent, since an instrument that continues to reward formal activity will continue to elicit formal activity from those who implement.

The study has three limitations. First, it uses aggregate data at the level of main sub-indices, because component-level data are not published in open form; it therefore cannot quantify the contribution of individual component indicators to aggregate movements. Second, it is descriptive and interpretive and does not test causal relationships between digital transformation and socio-economic outcomes. Third, given successive revisions of the framework, year-on-year comparison supports statements about trend direction rather than precise measurement. Promising extensions include testing beta and sigma convergence of the DTI across provinces, examining the relationship between the DTI and provincial GRDP growth or productivity using panel data, and assessing the efficiency of resource use in digital transformation through frontier methods.

8. References

1. Dang LTT. Assessing digital maturity level in the public sector: Policy and governance implications for digital transformation in Vietnam. *Ho Chi Minh City Open University Journal of Science - Social Sciences*. 2024; 19(2):61-81. Doi: <https://doi.org/10.46223/HCMCOUJS.soci.vi.19.2.3388.1014> (in Vietnamese)
2. Dang VD. The public sector's digital transformation in the Mekong Delta, Vietnam - Opportunities and challenges. *Can Tho University Journal of Science*. 2022; 58(SDMD):278-289. Doi: <https://doi.org/10.22144/ctu.jvn.2022.214> (in Vietnamese)
3. Mergel I, Edelmann N, Haug N. Defining digital transformation: Results from expert interviews. *Government Information Quarterly*. 2019; 36(4):101385. Doi: <https://doi.org/10.1016/j.giq.2019.06.002>
4. Ministry of Information and Communications. Report on the digital transformation index of ministries, ministerial-level agencies, government agencies and provinces, 2021. Information and Communications Publishing House, 2022a. <https://dx.gov.vn> (in Vietnamese)
5. Ministry of Information and Communications. Decision No. 922/QD-BTTTT of 20 May 2022 approving the Scheme for determining the Digital Transformation Index of ministries, ministerial-level agencies, government agencies, provinces and centrally governed cities, and of the nation, 2022b. (in Vietnamese)
6. Ministry of Information and Communications. Report on the ministerial-level and provincial-level digital transformation index, 2023, 2025. Released February 2025. (in Vietnamese)
7. Ministry of Science and Technology. Decision No. 405/QD-BKHCN of 3 April 2025 promulgating the Digital Transformation Index Framework, 2025a. (in Vietnamese)
8. Ministry of Science and Technology. Announcement of the 2024 Digital Transformation Ranking Results, October 21, 2025b. Doi: <https://mst.gov.vn> (in Vietnamese)
9. Nardo M, Saisana M, Saltelli A, Tarantola S, Hoffmann A, Giovannini E. Handbook on constructing composite indicators: Methodology and user guide. OECD Publishing, 2008.
10. Politburo of the Communist Party of Vietnam. Resolution No. 52-NQ/TW of 27 September 2019 on guidelines and policies for proactive participation in the Fourth Industrial Revolution, 2019. (in Vietnamese)
11. Resolution No. 52-NQ/TW of 27 September 2019 on guidelines and policies for proactive participation in the Fourth Industrial Revolution. (in Vietnamese)
12. Resolution No. 57-NQ/TW of 22 December 2024 on breakthroughs in the development of science, technology, innovation and national digital transformation. (in Vietnamese)
13. Prime Minister of Vietnam. Decision No. 749/QD-TTg of June 3, 2020 approving the National Digital Transformation Programme to 2025, with orientations to 2030 [Decision No. 749/QD-TTg of 3 June 2020 approving the National Digital Transformation Programme to 2025, with orientations to 2030], 2020. (in Vietnamese)
14. Prime Minister of Vietnam. Decision No. 942/QD-TTg of June 15, 2021 approving the Strategy for developing e-government towards digital government for the period 2021-2025, with orientations to 2030 [Decision No. 942/QD-TTg of 15 June 2021 approving the strategy for developing e-government towards digital government for 2021-2025, with orientations to 2030], 2021. (in Vietnamese)
15. Prime Minister of Vietnam. Decision No. 411/QD-TTg of 31 March 2022 approving the national strategy for developing the digital economy and digital society to 2025, with orientations to 2030, 2022. (in Vietnamese)
16. United Nations Department of Economic and Social Affairs. United Nations e-government survey 2024: Accelerating digital transformation for sustainable development. United Nations, 2024.
17. Van Dijk JAGM. Digital divide research, achievements and shortcomings. *Poetics*. 2006; 34(4-5):221-235. Doi: <https://doi.org/10.1016/j.poetic.2006.05.004>
18. Verhoef PC, Broekhuizen T, Bart Y, Bhattacharya A, Dong JQ, Fabian N, *et al.* Digital transformation: A multidisciplinary reflection, and research agenda. *Journal of Business Research*, 2021.