Analysis Of Digital Transformation At A Federal University Using The SCA Tool

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Artigo completo

Abstract. *Digital transformation has become increasingly relevant in academic environments, impacting the way institutions operate, relate to the academic community and seek to achieve their strategic objectives. Thus, the objective of the work was to evaluate the implementation of digital transformation in a Brazilian university using the SCA Methodology, to understand the impact of on strategic, cultural and business aspects and identify improvement opportunities to enhance this transformation. The results of this study show that distance education has acquired significant technological impulses with the demands of the COVID-19 pandemic and the digital transformation that occurred in this learning environment collaborated in adding value and increasing useful resources that have been in force as legacies today.*

Keywords: *Digital Transformation, Strategic Choice Approach, Academic Environment.*

Thematic Area: *Cibernética, Tecnologia e Administração*

1. Introduction

Digital transformation (DT) involves changes in organizational processes and attitudes, linked to the creation of new models (SALEM *et al.*, 2024), with the adoption of technologies that optimize operations and favor adaptive solutions (AMAN *et al.*, 2024), promoting resilience. It changes consumption patterns, expands the customer base and improves performance (CHENG *et al.*, 2023), requiring quick decisions in volatile scenarios (CORSO *et al.*, 2018). However, DT is not limited to technological implementation, and it is necessary to consider the transformative potential and align infrastructure and organizational structure.

Its focus is on economic efficiency, environmental performance and business models, but it involves risks such as lack of qualified labor (SKARE *et al.*, 2023). The DT strategy connects infrastructure and digital transformation (ZHANG *et al.*, 2023), improving operations, customer experience and simplifying processes (FEROZ *et al.*, 2021). It aims at greater collaboration, cost reduction and productivity (LLOPIS-ALBERT *et al.*, 2021).

More digitally mature organizations adapt better to changes and have a greater chance of success (FLETCHER; GRIFFITHS, 2020). DT is essential to achieve the SDGs, reconfiguring relationships between companies and stakeholders (BICAN; BREM, 2020), especially in sectors seeking competitiveness and overcoming challenges (MARTINI *et al.*, 2023; WESSEL *et al.*, 2021).

In higher education, DT goes beyond distance learning, aligning itself with the Information Society (TOURINHO; SOTERO, 2021). Digitalization includes new forms of organization based on information networks (FERREIRA, 2022), interacting with organizational routines and conditional practices (TOURINHO; SOTERO, 2021).

This study applies the SCA method (FRIEND; HICKLING, 2005), from Soft Operational Research, to assess strategic, cultural and adoption impacts of DT in institutions, seeking to identify challenges and good practices in this complex process.

2. Methodology

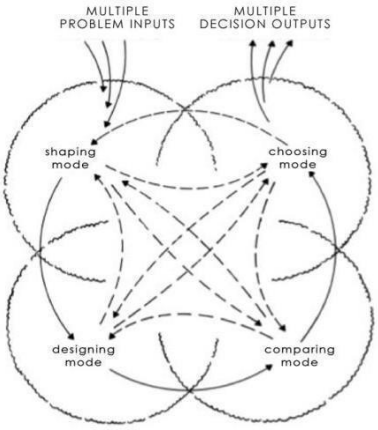
The methodological approach used in this research was the Strategic Choice Approach (SCA), one of the techniques classified within the Problem Structuring Methods (PSMs), known as Soft Operational Research (PO) methods. PSMs play a crucial role in providing clarity and efficiency in understanding complex problem situations, facilitating strategic decision-making in uncertain and dynamic environments. The subsequent segments present details about the methodology adopted.

2.1. Strategic Choice Approach (SCA)

The Strategic Choice Approach was developed by John Friend and his colleagues at the Institute for Operational Research, a method that can be understood for structuring problems (FRIEND *et al.*, 1970; FRIEND; JESSOP, 1969; FRIEND; HICKLING, 1987; FRIEND; HICKLING, 2005). Interactive comparisons of decision alternatives play a crucial role in identifying the main uncertainties of the problem. In essence, the group identifies priority areas, explores the problem and develops contingency plans

(FRIEND; HICKLING, 1987). Additionally, it provides interactive support for decision-making in complex situations (FRIEND, 1992). The application of SCA is subdivided into four phases, also known as modes: Shaping, Designing, Comparing and Choosing.

Figure 1. Structure of Method SCA



Source: Friend e Hickling, 2005.

In the first phase, called Shaping, the decision areas that will be addressed are conditioned, as well as the interconnection between them and the approach points. In the second phase, called Designing, decision options for each area and guidelines for decision making are proposed (FRIEND; HICKLING, 2005). Subsequently, in the third phase, known as Comparing, a comparative analysis of each scheme is carried out in relation to the focus defined by the planners. In this process, a score is assigned that indicates the advantage of each scheme in relation to a specific, previously established area of comparison, often using a grade of scales for this comparison (FRIEND; HICKLING, 2005).

In the fourth phase, entitled Choosing, areas of uncertainty that may hinder the decision-making process are identified. These areas of uncertainty are periodic in three categories: uncertainties related to the environment, linked to external factors; uncertainties related to guiding values, associated with the organization's principles; and uncertainties related to future decisions, linked to choices that may be made later (FRIEND; HICKLING, 2005).

The process is continuous, with planning, decision-making, and policy formulation activities occurring simultaneously and dynamically through interviews with stakeholders, helping to validate criteria and define uncertainties (FRIEND; HICKLING, 1987). The application of the SCA is divided into four phases: Modeling, Design, Comparison, and Choice (FRIEND, 1993). In the Modeling phase, decision areas and their interconnections are defined (FRIEND; HICKLING, 2005). In Design, decision options are proposed (FRIEND; HICKLING, 2005). In the Comparison phase, a comparative analysis of the options is conducted (FRIEND; HICKLING, 2005). Finally,

in the Choice phase, uncertainties are identified (FRIEND; HICKLING, 2005). The SCA aims to manage uncertainties and define priority actions, allowing participants to explore alternatives and develop contingency plans to address identified risks (MINGERS; ROSENHEAD, 2004).

3. Application of SCA in the implementation of digital transformation in the educational institution.

This study evaluates digital transformation at a Federal University in Rio de Janeiro, a public institution with a complex academic structure and diverse community of professors, students, and staff. Decision areas were defined based on (PACHECO *et al.*, 2021) and (RODRIGUES *et al.*, 2024), aligned with the institution's organizational structure and academic activities.

3.1. Shaping Mode

In Shaping Mode decision areas were identified based on the activities present within the institution where digital transformation (DT) is taking place, as illustrated in Table 1. The labels used to categorize and analyze data within these areas are fundamental for achieving a structure and comprehensive understanding of the various components of DT. These decision areas will be represented through a decision graph, a topological model that illustrates the interconnection among them. These areas were adjusted to the institutional context based on university stakeholders, specifically students, and the interviews supported the definition of the problem focus.

Table 1. Areas of Decision and Labels

DECISION	LABELS	DECISION	LABELS
EDUTECH?	Educational Technology	**ACTMETH?**	Active Teaching Methods
LEARNPL?	Learning Platforms	**ONGUIDA?**	Online Resources for Guidance
RESULAS?	Results Assessment	**REMACCE?**	Remote Access
EDUDATA?	Educational Data Analysis	**MONISUP?**	Monitoring Support
FLESCHE?	Flexibility of Schedules	**TECHTRA?**	Technology Training
DIGICOM?	Digital Communication		

The decision areas used in this study emerged from practical observation of the needs and challenges faced by educational institutions during digital transformation processes. Each area reflects a specific dimension of the educational reality: for example, EDUTECH? addresses the adoption of new technologies; ACTMETH? focuses on active teaching methodologies; LEARNPL? addresses learning platforms; and RESULAS? refers to results assessment. Other areas, such as REMACCE?,

MONISUP?, and FLESCHE?, capture issues of remote access, support monitoring, and schedule flexibility, while TECHTRA? and DIGICOM? address technological training for teachers and digital communication. Thus, the decision areas were not simply defined based on theoretical references, but also reflect the concrete situations and challenges faced in everyday educational life, ensuring that the decision frameworks considered aspects truly relevant to the implementation of digitalization and pedagogical innovation strategies.

Based on the analysis of these decision areas, Figure 2 illustrates the Problem Focus, delineated by a black boundary, as derived from this phase of the study. To define the boundaries of the Problem Focus, we evaluated the proximity, influence, and interrelationships among the identified decision areas. As a result, three key decision areas requiring significant effort were identified and selected for more detailed analysis. These areas constitute a subset of the broader decision graph and form the core of the Problem Focus.

Figure 2. Problem Focus

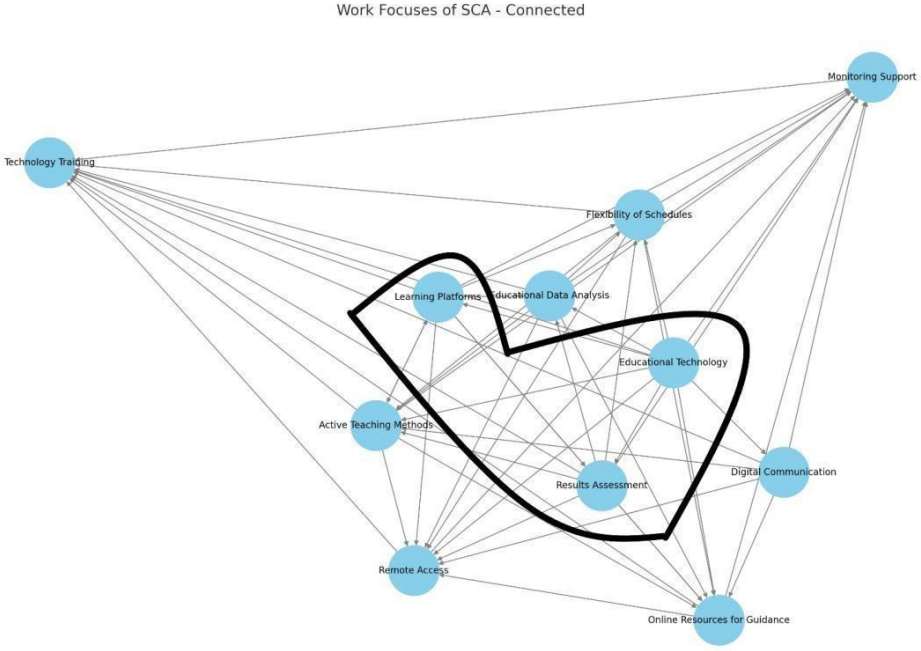


Figure 2 presents the decision areas EDUTECH?, LEARNPL? And RESULAS? illustrating different approaches to modernizing education. Each of these options offers a distinct path to improving teaching and learning:

- EDUTECH: transforms the classroom with advanced technologies, making learning more dynamic.
- LEARNPL: expands access to learning through online platforms, with flexibility and personalization.
- RESULAS: focuses on continuous assessment and use of data to improve educational results and pedagogical decisions.

These three decision areas — EDUTECH, LEARNPL, and RESULAS — were selected because they are considered central to digital transformation in the educational context, combining pedagogical impact, practical feasibility, and strategic relevance. EDUTECH was chosen because it represents the incorporation of advanced technologies that make learning more dynamic and engaging, essential for modernizing the classroom environment. LEARNPL reflects the expansion of access to learning through online platforms, enabling flexibility and personalized instruction, which is crucial to meeting the diverse needs of students and teachers. RESULAS focuses on continuous assessment and the use of educational data to guide pedagogical decisions and improve outcomes, ensuring that technological transformation is accompanied by effective monitoring and evidence-based learning. Therefore, the selection of these areas prioritizes the elements that have the greatest potential to generate an immediate and sustainable positive impact on educational practice.

3.2. Designing mode

In SCA's Designing mode, decision-makers explore future strategic options, aligning them with the organization's goals. This phase, which follows modeling (assessing the current state and identifying challenges), is crucial for defining the strategic paths to be followed, considering the specific context and priorities. This stage did not involve interviews with stakeholders, but was based on the literature.

Table 2. Decision Options

DECISION AREAS	DECISION OPTIONS	ACRONYM
EDUTECH?	Implement online platforms [Arghir, 2025]	E1
	Gradually introduce digital Technologies [Dwivedi, et al., 2023]	E2
	No implementation of educational technologies [Henrickson and Merono-Penuela, 2023]	E3
LEARNPL?	Learning management system [García-Penalvo, 2024]	L1
	Support distance learning disciplines [Arghir, 2025]	L2
	Don't invest in an LMS currently [Alier, García-Penalvo e Camba, 2024]	L3
RESULAS?	Implement comprehensive evaluation and results tracking systems [Henrickson and Merono-Penuela, 2023]	R1
	Not implementing results evaluation systems nor results tracking systems [García-Penalvo, 2024]	R2
	Start implementing results evaluation systems, starting with specific areas [Arghir, 2025]	R3

Table 2 presents an excerpt of Decision Areas and corresponding Decision Options within the context of the Designing Mode. It is worth mentioning that these Decision Options were obtained according to the discussion in the Literature, of some authors, as showed in table 2, who addressed the main issues and aspects involving the

use of digital transformation in education.

These options encompass a range of strategic choices that an organization may consider during the designing phase of the SCA. For instance, under 'EDUTECH?,' organizations can decide to implement online platforms, gradually introduce digital technologies, or opt for no implementation of educational technologies. Similarly, 'LEARNPL?' offers choices such as investing in a Learning Management System (LMS) to support distance learning disciplines or postponing such an investment. 'RESULAS?' presents alternatives for implementing comprehensive evaluation and results tracking systems or making phased decisions regarding their implementation.

In the context of Table 2, the decision options presented for each LABEL are mutually exclusive. Under the Decision Area 'EDUTECH?', organizations have three different options: implement online platforms, gradually introduce digital technologies or decide not to implement educational technologies. Once an organization opts for one of these options, the other two options are discarded.

The Decision Area 'LEARNPL?', organizations have three alternatives: invest in a Learning Management System to support distance learning subjects, support distance learning subjects without investing in a full LMS or decide not to invest in an LMS currently. When selecting one of these options, the other two are excluded, ensuring that the choice is clear and unambiguous.

Likewise, the Decision Area 'RESULAS?' presents unique alternatives for implementing comprehensive results evaluation and tracking systems. Organizations can choose to implement these systems, decide not to implement them, or begin implementation in specific areas. Again, by choosing one of these options, the others are discarded, allowing decision makers to focus on their chosen strategy without conflict or overlapping. These choices represent a key aspect of this mode, where decision-makers assess and deliberate upon the most suitable strategies to propel the organization forward in alignment with its overarching goals and objectives.

3.3. Comparison Mode

In this mode of the Strategic Choice Approach, decision-makers engage in a systemic evaluation of the decision options and scenarios generated during the Designing Mode. This phase entails a thorough examination of the advantages and disadvantages, feasibility, and potential outcomes associated with each decision option. A valuable tool for structuring this assessment is a decision tree, which supports the clarification of the implications of each decision option and assists the organization in identifying the most appropriate course of action. Figure 3 presents a decision tree that illustrates the evaluation process for the various decision options considered within the scope of SCA.

The systematic development of the decision tree yielded a total of 23 theoretically possible decision schemes. However, some of these combinations proved to be unfeasible, resulting in only 13 decision schemes (from A to M). The analysis was conducted as follows in this example: the combination of EDUTECH: E1 – Implement online platforms, LEARNPL: L3 – Do not invest in an LMS, and RESULAS: R1 – Implement comprehensive evaluation systems is deemed infeasible, as it is incoherent

to invest in robust online platforms without also adopting a Learning Management System (LMS), given that one relies on the other to operate in an integrated manner. This same rationale is applied to each branch of the decision tree.

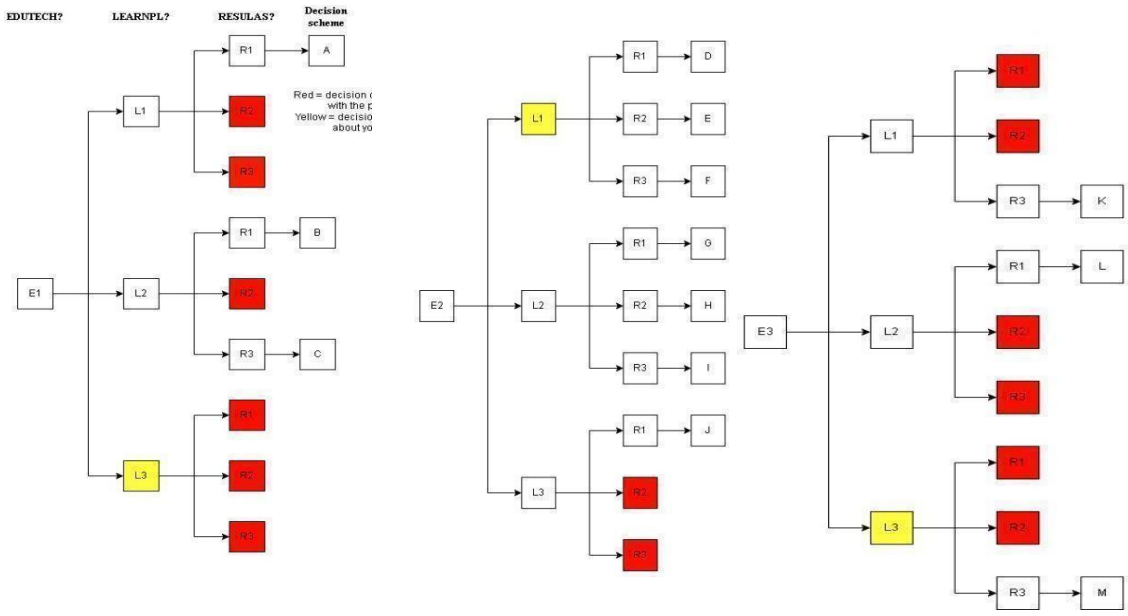
According to Wilkesmann (2024), collegiality can impact hierarchical decisions in the organization focusing on their strategic approach. Table 3, titled 'Criteria' presents a set of those criteria that organizations can use to assess the strategic options, identified in the decision tree above, aims to evaluate the strategic options of organizations, focusing on the hierarchical approach to decisions. These criteria, labeled as C1, C2, and C3, cover key aspects of resource consumption, a crucial consideration in the decision-making process. We briefly define each criterion:

- C1: Physical Resources – degree of use of physical resources (raw materials, energy, infrastructure) by a strategic option.
- C2: Financial Resources – necessary financial investments and expenditures, includingcosts, budget and revenue generation.
- C3: Human Resources – demand for personnel, skills and allocation of the workforce to implement the strategy.

Financial, and human resources are important for education because they allow institutions to provide a stable and safe environment for learning (GARCÍA-PENALVO, 2024). Physical resources in education are important for student development because they allow them to have practical experiences and experience concepts (HENRICKSON; MERONO-PENUELA, 2023). Effective school financial management is necessary to ensure the economic stability of schools and promote student learning to ensure their sustainability and educational quality (DWIVEDI *et al.*, 2023). Human resource management in education is important because it helps develop the human capital of institutions, promoting a work environment that favors teaching and learning (ARGHIR, 2025).

These criteria serve as valuable tools in the 'comparing mode' of the SCA. Decision-makers can use them to quantitatively and qualitatively assess how each strategic option aligns with the organization's resource constraints, objectives, and overall strategic goals. By systematically considering these criteria, organizations can make informed decisions that optimize resource allocation and support the achievement of desired outcomes.

Figure 3. Decision tree



The decision trees presented in Figure 3 were structured based on the combination of the strategic options selected for each of the three priority decision areas: EDUTECH, LEARNPL, and RESULAS. Initially, 27 possible combinations were generated, resulting from the Cartesian product of the options in each area. Of these, four combinations were considered inconsistent with the institutional reality and, therefore, excluded from the analysis due to practical or logical infeasibility, leaving 23 schemes. Subsequently, 10 additional schemes were discarded because they presented inconsistencies or required resources beyond the current institutional capacity, culminating in 13 viable schemes (identified by the letters A to M). The definition of the evaluation criteria—physical resources (C1), financial resources (C2), and human resources (C3)—was based on the literature and validated by experts in the field of university management, who were invited to provide their opinions on their relevance. To systematize the generation and analysis of the schemes, spreadsheets with consistency verification formulas and weighted averages were used, allowing for transparent and reproducible data organization.

3.4. Choosing Mode

Following these criteria present in Table 3, the alternatives presented in Figure 3 were scored in relation to each of these criteria according to a pattern that the higher the score, the better the decision(dos REIS *et al*., 2018). By assigning points and categorizing options based on predefined criteria, organizations can objectively select the most suitable strategy that aligns with their resource constraints and strategic goals. The option with the highest total points typically emerges as the preferred choice, offering a clear and quantitative basis for strategic decision-making. So, in table 4 the values used to rank those criteria can be seen, following an adapted Likert scale.

Organizing that way, the following table 5 can be achieved when all criteria and options are put together. In total, 15 students from the university in question were interviewed. The values in Table 5 are average values on the Likert scale.

Table 4. Evaluation Points

	POINT VALUE
Strong positive influence	5
Positive influence	4
Neutral/none influence	3
Negative influence	2
Strong Negative influence	1

Table 5. Areas of Decision and Labels

	C1	C2	C3
A	[4, 5, 3, 2, 4, 5, 4, 5, 2, 3, 4, 5, 5, 2, 3]	[1, 2, 3, 3, 2, 4, 1, 2, 3, 1, 4, 2, 3, 4, 1]	[5, 4, 3, 5, 4, 5, 4, 5, 2, 4, 3, 3, 5, 4, 3]
B	[2, 2, 3, 4, 5, 4, 5, 4, 3, 4, 3, 2, 1, 5, 2]	[5, 5, 4, 3, 2, 4, 3, 3, 2, 3, 4, 5, 5, 3, 4]	[1, 2, 5, 4, 2, 5, 4, 2, 3, 5, 4, 1, 2, 3, 5]
C	[4, 4, 4, 4, 5, 3, 4, 5, 3, 4, 3, 4, 5, 3, 2]	[3, 3, 2, 3, 2, 3, 3, 4, 4, 3, 2, 3, 3, 4, 3]	[5, 5, 4, 5, 5, 4, 4, 5, 5, 4, 3, 5, 5, 5, 4]
D	[2, 2, 2, 3, 4, 3, 4, 4, 2, 2, 3, 2, 1, 2, 2]	[3, 3, 2, 3, 4, 2, 2, 3, 2, 4, 3, 3, 3, 2, 3]	[1, 1, 5, 2, 3, 1, 4, 3, 1, 2, 1, 4, 1, 2, 1]
E	[5, 5, 5, 5, 5, 5, 4, 5, 5, 5, 5, 5, 5, 5, 5]	[5, 4, 5, 5, 5, 5, 5, 4, 5, 5, 5, 5, 5, 5, 5]	[4, 4, 4, 5, 4, 5, 4, 4, 4, 4, 4, 5, 4, 4, 4]
F	[1, 1, 1, 2, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]	[1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]	[1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1]
G	[2, 2, 2, 3, 4, 2, 4, 3, 2, 4, 4, 2, 1, 2, 2]	[2, 2, 3, 4, 3, 2, 3, 4, 3, 4, 3, 2, 2, 3, 2]	[1, 2, 3, 2, 1, 1, 2, 3, 4, 3, 2, 1, 4, 3, 2]
H	[4, 4, 4, 4, 4, 3, 5, 4, 4, 4, 4, 4, 4, 4, 4]	[4, 4, 3, 3, 3, 4, 4, 4, 3, 4, 4, 4, 4, 4, 4]	[4, 5, 5, 4, 4, 4, 4, 4, 5, 4, 4, 5, 4, 4, 5]
I	[4, 4, 4, 4, 5, 3, 4, 4, 5, 4, 4, 4, 5, 4, 4]	[4, 3, 3, 4, 5, 3, 4, 3, 4, 4, 5, 4, 4, 3, 4]	[4, 4, 5, 4, 4, 5, 4, 4, 4, 5, 4, 4, 5, 5, 4]
J	[3, 3, 3, 3, 3, 3, 3, 2, 3, 3, 3, 3, 2, 3, 3]	[3, 3, 3, 3, 2, 3, 3, 2, 3, 3, 3, 3, 3, 3, 3]	[3, 3, 3, 3, 3, 2, 3, 3, 3, 3, 3, 2, 3, 3, 3]
K	[2, 2, 2, 2, 2, 3, 2, 3, 2, 2, 2, 3, 2, 2, 2]	[2, 2, 2, 3, 2, 2, 3, 3, 2, 2, 3, 2, 2, 2, 3]	[2, 2, 3, 2, 2, 2, 2, 3, 3, 2, 2, 2, 3, 2, 3]
M	[2, 2, 2, 3, 3, 2, 3, 2, 2, 2, 2, 2, 2, 2, 3]	[1, 2, 2, 1, 2, 1, 1, 2, 1, 1, 2, 1, 1, 2, 1]	[4, 4, 4, 5, 4, 4, 4, 4, 4, 4, 5, 4, 4, 4, 4]

Decision scheme A tends to present higher values in criteria C1 and C3, with a higher frequency of values 4 and 5. Criterion C2 is more balanced, with a predominance of lower values, such as 1, 2 and 3. Thus, in general, A oscillates between medium and high. In decision scheme B, a mixture of frequencies is observed. In C1, value 4 appears more strongly, while in C2 there is a slight predominance of values 3 and 4. In C3, value 5 is the most common, followed by 2 and

Therefore, B tends to present medium values, with some specification for higher notes in some cases.

Decision scheme C is characterized by high frequencies: in C1, value 4 dominates; in C2, there is a greater incidence of 3; and in C3, 5 stands out. This indicates that decision scheme C tends to present high notes in most criteria. Decision scheme D, on the other hand, presents a greater concentration of serious values. In C1, value 2 is the most frequent; in C2, value 3 stands

out; and in C3, value 1 appears most frequently. Thus, D is a decision scheme with predominantly low scores.

Decision scheme E is markedly high. In all criteria (C1, C2 and C3), the values 5 and 4 dominate, with 5 being almost absolute. This decision scheme represents the upper extreme on the evaluation scale. On the other hand, decision scheme F presents extremely low values, being composed almost exclusively of scores 1 in all criteria. There is practically no variation, characterizing F as the decision scheme with the lowest performance.

In decision scheme G, the values vary a little more but still tend to be low to medium. In C1, values 2 and 4 stand out; in C2, points 2 and 3; and in C3, value 2 is the most present. Thus, G is positioned between the low and medium scores. Decision scheme H is quite homogeneous and high. In all criteria, the values 4 and 5 are predominant, especially 4. This indicates a consistent pattern of high evaluations.

Similarly, the decision scheme presents a strong presence of the values 4 and 5 in all criteria, with a fairly balanced distribution between these two values. Therefore, is a high-performance decision scheme. Decision scheme J is quite interesting because of its stability: value 3 appears in almost all cases in criteria C1, C2 and C3. Therefore, is a decision scheme that remains constant at a medium level. In decision scheme K, the frequency is strongly dominated by value 2 in all criteria, with some small appearances of value 3. Therefore, K is a decision scheme characterized by lower scores.

Finally, the decision scheme M presents a division: in criteria C1 and C2, lower values predominate, such as 2 and 1; in C3, there is a strong concentration of values 4. This indicates that M is a decision scheme that alternates between low and high performances, depending on the set.

Based on the analysis of the average values of the Likert scale and the interpretation of the decision schemes presented, the best decision scheme is scheme E, "Gradually introduce digital Technologies". In this scheme, the values 4 and 5 predominate in all responses, with the value 5 being almost absolute in several cases. This indicates that the students interviewed evaluated this option in an extremely positive and homogeneous manner, with no major negative oscillations between the criteria. In comparison, other schemes such as H and I also show good evaluations, but still present small variations, while E maintains high scores continuously.This decision scheme is a combination of options E2+L1+R2: gradually introducing digital technologies, implementing a Learning Management System (LMS), and not implementing results evaluation or tracking systems.

This combination achieved the highest evaluation because it addresses key needs for digital transformation in education while considering current constraints faced by educational institutions. Gradual introduction of technologies ensures smoother adaptation by students and teachers, implementation of an LMS supports the expansion of distance learning, and the postponement of results evaluation and tracking systems avoids overloading the system during the early stages of digital transition.

Regarding the support for distance learning disciplines, which received a strong influence in the evaluation, studies such as (ARGHIR, 2025) reinforce this decision. They demonstrate that the COVID-19 pandemic accelerated digital transformation in the education sector, pushing institutions towards broader adoption of digital platforms. However, (DWIVEDI *et al.*, 2023) emphasize that full digitalization still faces barriers such as lack of teacher training, insufficient pedagogical planning, and limited technological infrastructure. Therefore, the decision to gradually introduce digital technologies (E2) aligns with the realistic recognition of these challenges and avoids overwhelming the educational ecosystem.

The implementation of educational technologies, particularly through the introduction of a Learning Management System (LMS), also emerged as a priority. Rather than simply adopting technologies, the objective is to strategically integrate them to add value, optimize processes, and reduce bureaucracy, as highlighted by (HENRICKSON; MERONO-PENUELA, 2023). Technologies like virtual reality for applied content (GARCÍA-PEÑALVO, 2024) and Learning Analytics platforms (HENRICKSON; MERONO-PENUELA, 2023) show great potential, but their effective deployment depends on a structured platform like an LMS. Thus, implementing an LMS (L1) supports the necessary backbone for digital education without demanding full digital maturity from the beginning.

In contrast, while assessment and results tracking systems are valuable tools for monitoring student progress (ARGHIR, 2025; ALIER; GARCÍA-PEÑALVO; CAMBA, 2024), their implementation demands significant resources and a high level of digital readiness. Given the gradual digitalization process planned, prioritizing these systems at an early stage could divert attention and resources from the primary goals: consolidating the teaching platform and basic digital competencies. Therefore, opting not to implement results evaluation and tracking systems at this moment (R2) reflects a strategic prioritization, ensuring efforts are concentrated where the impact will be more immediate and sustainable.

Finally, although Learning Management Systems present challenges related to student adaptation and cultural or logistical barriers (ALIER; GARCÍA-PEÑALVO; CAMBA, 2024), the benefits, such as faster content updates, automated assessments, and enhanced remote training possibilities (GARCÍA-PEÑALVO, 2024; DWIVEDI *et al.*, 2023), outweigh the difficulties when implementation is approached carefully and progressively. This supports the choice of implementing an LMS as part of the first wave of digital transformation actions.

Thus, the combination of gradual technological adoption, implementation of a Learning Management System, and postponement of complex evaluation and tracking systems reflects a balanced, realistic, and sustainable approach to digital transformation in education.

4. Conclusion

Our study has demonstrated that SCA can be a valuable tool for organizations seeking to navigate the challenges of DT, such as the lack of digital skills and the need for an efficient structure in the digitized world. By evaluating criteria and objectively selecting the most suitable strategy, organizations can make well- informed and data-driven decisions that align with their resource constraints and strategic goals.

Findings suggest that SCA can help organizations to assess strategic options and evaluate criteria, leading to a clear and quantitative basis for decision-making. This approach can be particularly useful in the designing mode of SCA, where decision-makers assess and deliberate upon the most suitable strategies to propel the organization forward in alignment with its overarching goals and objectives. In the comparing mode of SCA, decision-makers delve into a systematic evaluation of the strategic options and scenarios generated during the designing mode. This phase involves a comprehensive assessment of the pros and cons, feasibility, and potential outcomes associated with each strategic choice. One useful tool for structuring this evaluation is a decision tree, which helps clarify the implications of each decision and guides the organization towards an appropriate course of action.

However, our study also has limitations, such as the focus on a specific sector. Future research should aim to replicate our findings in more diverse samples, as well as explore the applicability of SCA in other organizational contexts.

Overall, our research provides valuable insights into how organizations can use SCA to

address challenges and make informed decisions in their digital transformation strategies. By adopting a structured and data-driven approach to decision-making, organizations can navigate the complexities of DT and achieve their strategic goals.

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