Business-IT Alignment Maturity Diagnosis of a Health Organization using Luftman's SAM Model

Diagnóstico de madurez de alineación negocio-TI de una organización de salud utilizando el modelo SAM de Luftman

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ABSTRACT

Information technologies (ITs) provide optimization, service improvement, and a higher level of competitiveness, adding value to organizations' strategic results and enabling the implementation of digital transformation initiatives. However, organizations must achieve high alignment between business and IT strategies in order to maximize these contributions. Researchers have proposed various methods to improve alignment and have created measurement instruments to assess it within an organization. One of the most recognized is Luftman's SAM model (strategic alignment maturity model), which has a scale of five alignment levels and evaluates six dimensions. This work assesses the degree of alignment between business and IT units within a healthcare entity in Villavicencio (Colombia) using the Luftman instrument. The results indicate that the organization has a maturity level of 2, which denotes a low alignment. The organization needs to strengthen its IT unit and increase its participation in strategic planning.

Keywords: strategic planning, technology assessment, information technology, business management, strategic alignment

RESUMEN

Las tecnologías de la información (TI) brindan optimización, mejoras del servicio y un mayor nivel de competitividad, agregando valor a los resultados estratégicos de las organizaciones y posibilitando la implementación de iniciativas de transformación digital. Sin embargo, las organizaciones deben lograr una alta alineación entre las estrategias de negocio y de TI para maximizar estas contribuciones. Los investigadores han propuesto varios métodos para mejorar la alineación y han creado instrumentos de medición para evaluarla dentro de una organización. Uno de los más reconocidos es el modelo SAM de Luftman (modelo de madurez de alineación estratégica), que tiene una escala de cinco niveles de alineación y evalúa seis dimensiones. Este trabajo evalúa el grado de alineación entre unidades de negocios y TI dentro de una entidad de salud en Villavicencio (Colombia) utilizando el instrumento de Luftman. Los resultados indican que la organización tiene un nivel de madurez de 2, lo cual denota una baja alineación. La organización requiere fortalecer su unidad de TI e incrementar la participación de esta en la planeación estratégica.

Palabras clave: planeación estratégica, evaluación de la tecnología, tecnología de la información, administración de empresas, alineación estratégica

Introduction

The introduction of technology into our daily lives is an increasingly crucial issue in our society. Information technologies (ITs) allow organizations to optimize, improve, and revamp services and products, adding value to their strategic results. Moreover, digital transformation seeks to fulfill organizational and strategic transformation goals using digitalization strategies, frameworks, processes, and practices (Zhu *et al*., 2021). A recent Gartner publication predicts that 50% of organizations will experience more significant collaboration between business and IT teams by 2025 (Gartner, n.d.-a).

Nevertheless, practical evidence has shown that, for many organizations, it is hard to align business and IT appropriately. This impediment also affects the efforts of organizations that seek to advance digital transformation initiatives, since adequate IT-business alignment is an essential requirement to start a true digital transformation

(Lisienkova, 2017). Various approaches have been proposed to improve alignment, and measurement instruments have been created to assess its degree of maturity (Baker and Singh, 2019; Berberat and Baudet, 2019; Chan and Reich, 2007; Darii *et al*., 2020; Haghighi Rad and Rowzan, 2018; Henderson and Venkatraman, 1993; Luftman *et al*., 2017). Henderson and Venkatraman (1993) and Luftman (2000) identified six dimensions that should be evaluated and controlled in order to reach a harmonic IT-business relationship that leads to proper alignment and the achievement of an organization's goals.

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In the case of manufacturing companies, the digital transformation of industrial production requires not only the adoption of cyber-physical systems and Internet of Things (IoT), platforms but also a focus on readapting processes and the overall organization in order to deal with a business and added-value problem. Issa et al. (2018) presented a framework to both assess and advise Industry 4.0 implementations. This framework takes some elements and concepts from capability maturity models (CMM) and the alignment models regarding ITs and strategies, business processes, and organizational structures. In a more general business framework, Maciá Pérez et al. (2021) proposed a model for implementing and operating a portfolio of strategic IT projects, aligning IT with business goals by involving top management levels in decision-making, and promoting cooperation, communication, and leadership. After studying 43 small- medium-sized enterprises (SMEs), Canhoto et al. (2021) set out to determine how digital alignment is reached. Their findings, as well as an initial framework and an inductive analysis, were used to propose a model for digital alignment in SMEs. These authors identified five phases of digital aligning, ranging from passive acceptance to transformation.

Using the Luftman instrument, several companies in different economic sectors have been evaluated with the purpose of assessing their degree of alignment. One recent study involved 395 companies in the US Fortune 1 000 list (Luftman et al., 2017), 2,87% of which belonged to the healthcare sector. Moreover, it is worth mentioning that, among the organizations in this sector, ITs are given little importance, even though healthcare is a key aspect for developing countries, especially given the current public health conditions around the world.

The past several years have been grueling for the healthcare and life sciences industry, with internal and external dynamics collectively forcing organizations to transform their operation and business models.

The shortage of healthcare workers is a growing problem, and healthcare delivery organizations (HDOs) are exploring digital health alternatives to meet the demand. Digital health products and services have shown good results with regard to enhancing patient experience, improving population health, reducing costs, and improving the work life of healthcare clinicians and staff. The COVID-19 pandemic has accelerated the adoption of digital health technologies in the industry, and HDOs now agree on the need to accelerate digital transformation (Gartner, n.d.-b).

According to Gartner, HDO CIOs (Chief information Officers) should take the following steps to accelerate digital transformation in the healthcare industry (Gartner, n.d.-b):

- Enabling consumer engagement, activation, and the delivery of digital health and healthcare services by adopting digital-first technology domains. This includes telehealth, remote patient monitoring, and patient portals.

- Seizing the opportunity created by the COVID-19 pandemic to deploy enterprise-grade, digital-first technology domains within pandemic-driven digital initiatives. This will help HDOs prepare for the future.

- Prepare for a new normal by adopting a digital-first business strategy that makes digital interactions the first, the preferred, and the pervasive medium for engagement, health, and healthcare delivery. This will require a significant cultural shift within HDOs, but it is essential for the future of the healthcare industry.

In Colombia, the healthcare sector is highly problematic and the origin of the most significant citizen complaints. However, digital transformation is somehow changing the healthcare sector in Colombia. The government has invested in digital health initiatives, such as electronic health records and telemedicine, in order to improve quality, efficiency, and access to care. These investments have the potential to make a significant impact on healthcare in Colombia. In the strictly technological aspect, there are still no guidelines for implementing architectures that integrate health information systems and technological platforms, and many local solutions have emerged over time (Bernal-Acevedo and Forero-Camacho, 2011). In many cases, IT solutions are not integrated with or incompatible with government systems, causing serious problems for information exchange. As a result, isolated systems support business processes, leading to duplicated efforts, low data quality, and low coverage. This lack of integration, resources, and standardization results in poor patient care and low-quality health services.

Furthermore, health data constitute a fundamental input for the management of information and knowledge aimed at strengthening regional and state-wide decision-making. The information generated would make it possible to anticipate health trends and take proactive and deliberate actions to face any challenges or threats to the population (Castrillón et al., 2012). However, this use of data, and their subsequent transformation into information and knowledge requires an adequate alignment of the business units and ITs used in the health sector. In light of the above, the research question that guides our case study is as follows:

What is the maturity level of the strategic alignment between the business and IT units within a healthcare entity in Villavicencio, Colombia?

To answer this question, and as an initial exploratory step, this study aims to diagnose the maturity of the strategic alignment within an entity in the health sector using Luftman's strategic alignment maturity (SAM) model. Diagnosis is an essential first step to plan IT-business alignment for the region's health sector and subsequently change the business strategy and adopt advanced digital technologies that support it (Zeebroeck et al., 2023).

We analyzed the technological alignment factors in the dimensions given by Luftman's SAM model. Specifically, we conducted a case study to diagnose the maturity of alignment between the IT and business units in an institution from Villavicencio's health sector (Colombia). Additionally, we used this study to assess the instrument used as a cross-sectional aspect. Based on this experience, we provide recommendations for using the model and point out its possible limitations and benefits with regard to the studied problem.

The remainder of this paper explores the following aspects. Firstly, it presents the conceptual foundations, background, and description of Luftman's SAM model. Next, it describes the most relevant characteristics of the healthcare entity under analysis. The paper then explains the implementation of Luftman's SAM instrument within this entity. Subsequently, it summarizes the results according to the dimensions defined by Luftman. A comparison between our results and those of previously reported healthcare and Latin American organizations follows. Finally, the paper discusses the possible limitations of this work and the application of the instrument and concludes with key takeaways and proposals for future work.

Strategic alignment and Luftman's SAM

This section presents the conceptual foundations of business-IT alignment (BITA) and the existing strategic models, emphasizing the features of the SAM model.

Conceptual foundations

BITA studies the process and results of strategic alignment between IT units and the business strategy. A detailed definition by Luftman et al. (2017, p. 2) states that BITA "addresses both how IT is in harmony with the business, and how the business should, or could be in harmony with IT. Alignment evolves into a relationship where the function of IT and other business functions adapt their strategies together." Other authors who have studied the benefits of using ITs in companies also call it *leverage/linkage* (Henderson and Venkatraman, 1993), *enablement* (Chan et al., 1997), *transformation* (Luftman, 2000), and *business processes optimization* (Sabherwal and Chan, 2001). Other studies focus on the relationship between the IT and business domains and refer to it as *fit* (Benbya and McKelvey, 2006), *linkage* (Reich and Benbasat, 2000), *matching* (Chan et al., 1997), *bridging* (Zee and Jong, 1999), *fusion* (Smaczny, 2001), and *harmonization* (Chan, 2008).

Achieving BITA involves translating communication and strategy at executive levels (Sabherwal and Chan, 2001). Today, a successful BITA focuses on organizations' tactical and operations levels and management activities in order to achieve cohesive business and IT operations (Tarafdar and Qrunfleh, 2009). Therefore, it requires strong support from senior managers, proper prioritization, trusting relationships, and effective communication between different levels (Avison et al., 2004). Other authors suggest that enterprise architecture (EA) has the potential to improve and support strategic alignment. Bhattacharya (2017, 2018) proposes a model that relates the Open Group Architecture Framework's constructs (TOGAF) with a technique for modeling strategic alignment that also enriches the original SAM model (Henderson and Venkatraman, 1993). Achieving BITA also leverages digital transformation initiatives, which requires rapid changes in IT infrastructure and strategic direction (Zeebroeck et al., 2023).

In management sciences, several efforts turn to studying and operationalizing alignment (Al-Surmi et al., 2020; Chi et al., 2020; Duhamel et al., 2021; Ghonim et al., 2020; Hart and Burke, 2020; Strategic Direction, 2019; Miyamoto, 2019; Patterson, 2020; Sabherwal et al., 2019; Sholihah et al., 2019). For example, Bernat and Karabag (2019) analyze how organizations can overcome shortcomings in knowledge and technology by systematically monitoring their environment and building an alignment strategy. All this, by identifying technological challenges and focusing and managing a research and development (R&D) portfolio that, in the end, optimizes technology upgrading and maximizes results.

Luftman's SAM model

Luftman presented the SAM model in his 1996 book titled *Competing in the information age: Strategic alignment in practice* (J. N. Luftman, 1996). This model defines six dimensions to categorize the degree of alignment of an organization's business and IT units. Each dimension is evaluated using a five-level capability scale (Table 1).

Likewise, Luftman defines six dimensions with 41 attributes for assessing BITA (Luftman, 2000), wherein evaluations are carried out via a five-point Likert scale questionnaire. The dimensions and their attributes are presented in Figure 1.

Other authors report using Luftman's instrument, for instance, to assess and identify the impact of IT governance implementations on BITA (de Haes and van Grembergen, 2009). Furthermore, Latin America (Gutiérrez et al., 2008, 2009; Torres-Moreno and Aponte-Melo, 2021) and Russia (Lisienkova, 2017) report assessments of several industrial sectors' alignment that employ data collection from individuals in SMEs.

Description of the analyzed healthcare entity

The Department of Meta (Colombia) has 98 1726 inhabitants in 29 municipalities, covering a large part of the Orinoquía region. Its capital is Villavicencio, which has more than 450 000 inhabitants (DANE, n.d.) and the region's most specialized healthcare service levels. Villavicencio has more than 397 entities that provide and promote health services. Moreover, the Departmental Hospital and 42 clinics serve 104 372 people, corresponding to 23% of the citizens (Secretaría de Salud del Meta, n.d.).
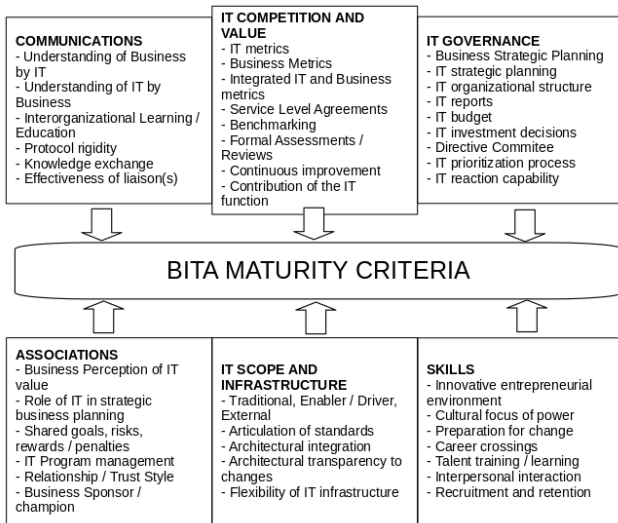
Figure 1. Alignment maturity dimensions and criteria
Source: Adapted from (J. Luftman, 2000)

The selected healthcare entity has provided both basic and specialized services to the citizens of Villavicencio and the Orinoquía region since the 1970s. However, according to the established national classifications, it does provide services at the most advanced level. Its services include intensive care units (ICU), hospitalization, surgery, outpatient consultation, diagnosis, therapeutic support, emergencies, rehabilitation, medical and surgical treatments, and highly qualified specialists. For the sake of confidentiality, this hospital is hereinafter referred to as *the healthcare entity*.

Table 1. Description of maturity levels

Level	Description
1 – Initial	The organization has the lowest maturity level regarding alignment.
2 – Committed processes	The organization has an initial commitment to strategic alignment between the IT and business units.
3 – Established and focused processes	The organization exhibits strategic alignment focused on the IT areas and prioritizes some organizational objectives.
4 – Improved/ managed processes	The organization shows a good management regarding strategic alignment with IT. The administration stresses the concept of *IT* as an element of value for the organization.
5 – Optimized processes	The organization has achieved a high alignment between ITs and business strategies.

Source: (J. Luftman, 2000)

Organizational structure

The healthcare entity has more than 700 employees, including administrative and functional areas. The entity's workforce can be grouped into four areas: administrative, healthcare, IT, and support staff (Table 2). There is a general management unit in its organizational structure, on which

two management units and three directorates depend. The two management areas are called *Medical Management* and *Administrative/Financial Management*, while the three directorates are *Human Resources*, *Operations*, and *Technology*. The Technology Directorate provides services to all of the entity's supporting processes, which are both managerial and operational in nature.

Table 2. Amount of personnel per area

Area	People	%
Administrative	19	3
Healthcare	541	73
IT	7	1
Support staff	172	23

Source: Authors

Diagnosis of the business-IT maturity level

This study is a descriptive research with a mixed approach (Yin, 2010). It is based on the questionnaire defined by Luftman (Luftman *et al.*, 2017). Considering that the instrument is designed for business and IT areas, a discretionary sample of 31 people from the administrative, healthcare, and IT areas was interviewed and surveyed.

This section clarifies the processes carried out to apply Luftman's instrument: data collection, information processing, and results interpretation.

Applying Luftman's SAM instrument

One of the authors interviewed the selected staff, collecting qualitative information to understand the organization and the personnel's perspectives on each evaluated factor. The interviewer clarified the study's objectives in each meeting and characterized the interviewee (role, responsibilities, and experience). Then, the questionnaire was applied. The interviews lasted approximately one hour, and they were carried out between December 2019 and April 2020.

Data collection

The data collection process was backed by the healthcare entity's Quality Office and was conducted as follows. First, we identified key personnel in each organizational unit in order to interview them. They were classified into three categories according to their participation and responsibilities in strategic management within their units: i) **strategic**: people who make strategic decisions; ii) **functional**: employees responsible for the operation and monitoring of strategic decisions within the unit; iii) **operational**: staff who are in charge of executing day-to-day operations and are generally are not involved in making strategic decisions. Second, we contacted the selected staff to explain the study's goals and procedure. Third, we carried out five pilot tests in the healthcare entity with people from each administrative, IT, and support area. These tests allowed fine-tuning the

procedure and vocabulary used, making the necessary adjustments to clarify the questions, and improving the tools employed (presentation, form, and interview). Lastly, we scheduled and conducted the interviews in order to apply the Luftman instrument and collect information. Table 3 shows the categorization of the interviewees.

This study's data come from the interviews and Luftman questionnaire responses. In addition, 27 out of 31 interviews were recorded, transcribed, and examined in order to obtain relevant information for each dimension of the Luftman instrument. The data collected were synthesized in tables and graphs, and basic descriptive statistical methods were used to analyze them.

Table 3. Distribution of the interviewed personnel

Process	Strategic	Functional	Operative
General management	1		
User management		1	
Quality management	1	4	
Purchases and storage management	1		
Infrastructure management		2	
Admissions		1	
Financial management	1		
Human resources		1	
Hospitalization		2	
Legal		1	
Service delivery planning	1		
Radiology and imaging		1	
Ambulatory services		2	
ICU Adults		1	
Surgery		2	
UCIA (intensive care unit for adults)		1	
UCIN (intensive care unit for neonates)		1	
Emergencies		1	
Statistics		1	
IT Directorate	1		3
Total	**6**	**22**	**3**

Source: Authors

Results interpretation

This section summarized the results obtained according to the six dimensions defined by Luftman(J. Luftman *et al.*, 2017). The average response to each question is tabulated for each dimension, and the general average is also presented. In all cases, the scores range from one (the lowest grade) to five (the highest grade). These quantitative data are briefly analyzed and complemented with a synthesis of the interviewees' perceptions.

Communication

Table 4. Communication

Question	1	2	3	4	5	6
Average	2,68	2,48	2,77	2,10	2,35	1,61
Dimension average: 2,33						

Source: Authors

First of all, the scores indicate that one area's knowledge of the other is limited (Table 4. Communication). The data collected show that the current flow and effectiveness of the communications between the IT and business areas do not allow them to fully understand each other's processes, functions, strategies, plans, IT environments, risks, and priorities. They exchange information primarily when the internal needs of the entity require it. Instead of having permanent channels to promote the transfer of information and collaboration, the manager of each area works individually, guided by their own needs and plans.

Moreover, the effectiveness of the knowledge exchange is low. They have semi-structured guidelines, and there is no complete understanding of them. There is no cohesion at the strategic level between the IT and business areas; their communication is mainly transactional, where priorities are associated with operational information.

The organization is increasingly aware of the benefits of technology to all its processes. For example, the management of information systems has helped the institution fulfill the national regulations regarding the periodic report of the variables requested by the government institutions for surveillance and control purposes. Furthermore, it is worth noting that the structuring and exchange of knowledge between the IT and business areas are underway.

Furthermore, it is worth mentioning that the entity uses standard methods to offer organizational learning sessions, as defined in its internal communication manual. We can conclude that the organization has a hierarchical and bureaucratic organizational structure, and that the communication style is mainly unidirectional: from the strategic levels to the other dependencies.

IT competence and value

Table 5. IT competence and value

Question	1	2	3	4	5	6	7	8
Average	1,40	1,87	2,00	2,00	2,03	2,13	1,94	4,00
Dimension Average: 2,17								

Source: Authors

The results in this regard (Table 5) reveal that the healthcare entity does not use metrics for measuring the value added by IT to the business strategy. The institution uses measures to assess technical factors such as the system's availability

and response times. However, they only perform a cost-benefit evaluation of IT investment regarding administrative and managerial matters when the need arises. There is no systematic feedback between the IT and business areas, which is corroborated by the interviewees' opinions.

Service-level agreements are oriented towards operational issues. In that sense, any established processes should measure and track user satisfaction, and the information collected should be the basis for implementing improvement actions.

Benchmarking practices are beginning to be used. During this study, the organization was migrating to a new information system that offers more and better functionalities and encompasses more business processes. This new system was selected through a rigorous benchmarking process that involved all interested areas.

It was found that 77,4% of the participants believe that IT has made a solid contribution to achieving the organization's strategic objectives. This suggests that IT supports their business goals despite lacking formal metrics.

IT governance

The evidence shows that business planning is carried out with minimal participation from the IT area (Table 6. IT governance). Moreover, there is no specific IT budget, and, like any other institution's IT department, the area determines its needs and submits them to the financial area. After that, the financial area makes decisions regarding financial approval, considering all requests from all areas. Due to this competition for resources, IT projects are sometimes not funded.

Table 6. IT governance

Question	1	2	3	4	5	6	7
Average	2,29	2,33	1,48	3,03	2,10	1,90	3,10
Dimension Average: 2,32							

Source: Authors

Despite this, the participants know that IT is an enabler of business strategy. In other words, the organization recognizes that IT investment decisions are strongly connected to improving business effectiveness. Furthermore, it is well known that IT cannot appropriately respond to all of the organization's requests, as it is such a small area. Thus, the perception that IT does not respond appropriately to business requirements is justified.

In this dimension, it is interesting that the assessment of the seven factors was dispersed. The lower-graded factors indicate that the healthcare entity must improve the IT budget criteria and prioritize IT projects. The need to strengthen the IT department is evident; it requires a stable budget that allows them to carry out more technology projects. A

requirements engineering process should be implemented, so that each department can determine the best way to enhance business processes through IT.

Partnership/association

Table 7. Partnership/association

Question	1	2	3	4	5	6
Average	3,39	2,39	1,67	2,14	3,00	2,32
Dimension Average: 2,48						

Source: Authors

As already mentioned, the IT area is perceived as a fundamental enabler of business operations. All interviewees consider that information systems are easing decision-making by providing accurate and timely data. Although the IT area is still used more to enable business processes than to drive its strategy, they already regard the association between the areas as a long-term relationship.

According to the responses, the entity manages relationships on an *ad hoc* basis, without formal processes between areas or a high-level promoter from the business area who drives initiatives (Table 7. Partnership/association).

A fact that stands out is that 45,16% of the respondents perceive the IT area as a fundamental driver for the entity's activities. Moreover, 51,61% consider IT to be responsible for most risks and state that it receives little reward for successful initiatives.

There are divergent opinions regarding the type of relationship between IT and the business. For the functional areas, the relationship with IT is transactional, *i.e.*, they mainly request and receive technical support. In contrast, the relationship is viewed as a partnership with regard to administrative roles and IT.

Scope and infrastructure of IT

For the majority of the interviewees, the technological infrastructure is driven by business strategy requirements. For some, it is emerging as a resource that can enable a rapid response to changes in the market (Table 8. Scope and infrastructure of IT). However, from the IT area's perspective, this is achieved at a very high cost and with a meager reward. Thus, for them, there is a clear effort-reward imbalance.

Table 8. Scope and infrastructure of IT

Question	1	2	3	4	5
Average	2,39	2,21	2,17	1,23	2,55
Dimension Average: 2,11					

Source: Authors

The healthcare entity mostly has transaction-oriented information systems and business process enablers. In this case, standards are applied at the functional area level for all patient care management.

Furthermore, changes in the entity systems are generally disruptive, affecting the functional units where the change requirements arise. 77,42% of the interviewees indicate that changes cause inconveniences and affect their activities. Furthermore, 35,48% indicate that the business strategy's requirements determine the organization's technological infrastructure.

This dimension exhibited the lowest score, with a maturity degree of 2. This result reveals a low level regarding infrastructure flexibility and the ability to incorporate and manage new technologies.

IT skills

Table 9. IT skills

Question	1	2	3	4	5	6	7
Average	2,35	2,19	2,97	1,82	1,97	3,06	2,38
Dimension Average: 2,39							

Source: Authors

For the analyzed entity, entrepreneurship is moderately encouraged by functional units, and essential technology decisions are regularly made by senior management (Table 9. IT skills).

As an institution regulated by health protocols, it is well prepared for changes at the functional level. IT is currently making a software change to manage its missional patient care and transversal processes. Likewise, we identified a well-defined process for managing resistance to change through training programs, awareness campaigns, information dissemination initiatives, and feedback.

Staff exchange between the IT and business areas seldom occurs. Most of the personnel interviewed express that genuine trust has been reached between the two areas. Hiring is focused on the applicant's technical expertise. The institution has training plans, but they depend on the needs of the functional units.

Findings and recommendations

According to our analysis, there is an evident effort-reward imbalance in the IT area. Currently, IT is the area that assumes all the risks associated with IT-based decisions and receives a low reward for its work with all of the entity's units. Risks must be shared with the business area as a necessary attitude for establishing trust and partnership between them. As stated by Maciá Pérez et al. (2021), the senior management level must be involved in IT strategy and plans to improve alignment and enable the digital transformation of business processes.

Similarly, we suggest starting an internal program that addresses the lack of knowledge about the value of IT for the entire organization. This should make IT plans, strategies, and actions known and stress the importance of funding IT initiatives. Understanding that technology infrastructure and the strategic direction of the organization must be synchronized is pivotal for addressing new business opportunities (Zeebroeck et al., 2023).

It would be helpful for managers to acquire a deeper understanding of the processes, roles, and responsibilities of other areas. This will enrich knowledge and facilitate the construction of more cohesive strategic plans, allowing to develop projects that meet the requirements of the business, as well as for the continuous evaluation, control, and evolution of the organization's enterprise architecture.

The interviews uncover the lack of effective communication, showing that there is currently no full integration of IT into business areas. Each area is only qualified to perform its tasks and executes them according to what is established. Most interviewees have a comprehensive understanding of organizational strategies, plans, and goals but are unaware of IT environments and their management.

The priorities regarding interaction between the IT and business areas are determined more by periodic needs than by precise requirements that allow the institution to achieve a managed business architecture. In addition, there is no consolidation of risks that allows generating a response and contingency plans to transversal processes; only those of the IT area are established. Therefore, IT must lead a holistic study of the risks since they have more knowledge about their consequences and the strategies for mitigating them.

Likewise, our analysis indicates that the healthcare entity does not use metrics to assess the contribution of IT in reaching its strategic goals. It is quite noticeable that there is little participation by the IT and business areas in planning (IT governance dimension). This state of affairs leads to a basic structuring that seeks to meet the functional needs rather than strategic ones.

Moreover, it is necessary to strengthen mutual trust between the areas in order to consolidate the role of IT in the organization, as well as to formalize processes so that IT initiatives are better supported by business personnel.

The scope and strength of the IT area are limited due to the unit's small size, both in staff and equipment. This lack of resources reduces its capacity to provide flexibility and support for the infrastructure. Improving IT size, resources, training, and skills should aim towards ensuring its suitability to carry out current activities and overcome future challenges.

Despite the low maturity level and the limitations regarding personnel and resources in the IT area, it is essential to recognize that the IT department supports information

technologies that allow the institution to fulfill the goals of the healthcare sector and timely report to the regional surveillance entities.

It is worth mentioning that the healthcare entity has taken an essential step by changing the technology used in order to control transversal and core mission processes. Gradually, the other areas are giving more importance to the role of IT. Thus, the entity is evolving into a state where the IT area defines business strategies and plans. The role of IT will transition from a mere service provider to an enabler of the organization's strategic plans.

The Ambulatory and Hospital Health accreditation process that the entity has undertaken allows it to design and improve processes that will be fundamental to reach the next degree of maturity. Some of them are related to information management, as the Ministry of Health seeks to integrate all healthcare and administrative areas. This integration will also bolster all technical resources and improve decision-making at all levels, in addition to technology management (Ministerio de Salud, 2018).

Limitations of the case study

While the COVID-19 pandemic undoubtedly presented challenges, we were fortunate to complete the interviews for this study. Now, we can turn our attention to understanding the impact it had on both the interview process and the institution itself.Second, based on our experience with the Luftman instrument, we believe that its application must be preceded by a characterization of the entity, allowing the interviewers to become familiar with core aspects of the institution, such as its organizational culture, structure, mission and vision, values, and principles. Third, although the instrument's application reveals the alignment gaps between the IT and business areas, the design of an action plan that ensures alignment is not evident and direct. Finally, we consider it essential to carry out the interviews in person, in addition to guiding the respondents, as they may not understand the terminology of the questionnaire or misinterpret its questions.

Conclusions and future work

In this paper, we applied the strategic alignment maturity (SAM) model to diagnose the maturity of strategic alignment in a healthcare entity. Our findings indicate that the entity's IT area is little involved in the organization's strategic planning. This suggests that more integration between the IT and business areas is needed to develop joint strategic plans and programs.

Gartner reports (Gartner, n.d.-a) that healthcare providers are planning to invest in AI/ML, distributed cloud, responsible AI, multi-experience development platforms, 5G, and other technologies for 2025. They are also investing in cybersecurity/information security, application modernization, business intelligence/data analytics, cloud platforms, and enterprise resource planning. This is in line with our findings, which indicate that the healthcare entity is investing in new technologies but is not yet fully aligned with its strategic goals.

The pace of digital transformation in healthcare provider organizations is accelerating, and CIOs and technology executives are anticipating increased investments in IT to achieve their organizations' strategic objectives. However, they are also facing challenges in establishing a shared enterprise digital vision.

Here are some specific challenges that CIOs and technology executives are facing:

- *Reconciling new technologies with existing enterprise strategies*. New technologies like AI/ML offer transformational clinical and business benefits, but they can be difficult to integrate with existing enterprise systems.

- *Achieving consensus and developing a clear action plan*. It can be difficult to get everyone on the same page regarding the organization's digital transformation strategy.

Despite these challenges, the future of healthcare is digital. CIOs and technology executives who can successfully navigate these challenges will be well-positioned to lead their organizations into the digital age.

In addition to the above, we believe that the Luftman instrument remains a relevant tool for IT governance and digital transformation initiatives within organizations. It can be used to diagnose the maturity of strategic alignment, to develop a roadmap for improvement, and to complement initiatives such as digital maturity models (DMM) (Nebati *et al.*, 2023) or readiness assessments (Silva *et al.*, 2022).

We also believe that it is important to develop methods and actions aimed at creating and maintaining a close and harmonic relationship between business and IT strategies. This will be essential for healthcare organizations to succeed in the digital age.

We hope that our findings will be useful to healthcare organizations seeking to improve their strategic alignment and digital transformation efforts.

CRedit author statement

All authors have participated in a) conception and design or data analysis and interpretation; (b) drafting the article or revising it critically for important intellectual content; and (c) approving of the final version of the manuscript.

References

Al-Surmi, A., Cao, G., and Duan, Y. (2020). The impact of aligning business, IT, and marketing strategies on firm performance. *Industrial Marketing Management*, *84*, 39-49. https://doi.org/10.1016/j.indmarman.2019.04.002

Avison, D., Jones, J., Powell, P., and Wilson, D. (2004). Using and validating the strategic alignment model. *The Journal of Strategic Information Systems*, *13*(3), 223-246. https://doi.org/10.1016/j.jsis.2004.08.002

Baker, J., and Singh, H. (2019). The roots of misalignment: Insights on strategy implementation from a system dynamics perspective. *Journal of Strategic Information Systems*, *28*(4), 101576. https://doi.org/10.1016/j.jsis.2019.101576

Benbya, D. H., and McKelvey, B. (2006). Using coevolutionary and complexity theories to improve IS alignment: A multi-level approach. *Journal of Information Technology, 21*(4), 2000080. https://doi.org/10.1057/palgrave.jit.2000080

Berberat, S., and Baudet, C. (2019). *Assessing a business software application using strategic IT alignment factors: A new way for IS evaluation?* [Conference presentation]. ICEB 2019, Newcastle, UK. https://aisel.aisnet.org/iceb2019/19

Bernal-Acevedo, O., and Forero-Camacho, J. C. (2011). Sistemas de información en el sector salud en Colombia. *Gerencia y Políticas de Salud*, *10*(21), 21. https://doi.org/10.11144/Javeriana.rgsp10-21.siss

Bernat, S., and Karabag, S. F. (2019). Strategic alignment of technology: Organising for technology upgrading in emerging economy firms. *Technological Forecasting and Social Change*, *145*, 295-306. https://doi.org/10.1016/j.techfore.2018.05.009

Bhattacharya, P. (2017). Modelling strategic alignment of business and IT through enterprise architecture: Augmenting Archimate with BMM. *Procedia Computer Science*, *121*, 80-88. https://doi.org/10.1016/j.procs.2017.11.012

Bhattacharya, P. (2018). Aligning enterprise systems capabilities with business strategy: An extension of the strategic alignment model (SAM) using enterprise architecture. *Procedia Computer Science*, *138*, 655-662. https://doi.org/10.1016/j.procs.2018.10.087

Canhoto, A. I., Quinton, S., Pera, R., Molinillo, S., and Simkin, L. (2021). Digital strategy aligning in SMEs: A dynamic capabilities perspective. *The Journal of Strategic Information Systems*, *30*(3), 101682. https://doi.org/10.1016/j.jsis.2021.101682

Castrillón, H. Y., González, C., and López, D. M. (2012). Modelo arquitectónico para interoperabilidad entre instituciones prestadoras de salud en Colombia. *Revista Ingeniería Biomédica*, *6*(12), 3-13, https://dialnet.unirioja.es/servlet/articulo?codigo=4226425

Chan, Y. E. (2008). Why haven't we mastered alignment? The importance of the informal organization structure. *MIS Quarterly Executive*, *1*(2), 2.

Chan, Y. E., Huff, S. L., Barclay, D. W., and Copeland, D. G. (1997). Business strategic orientation, information systems strategic orientation, and strategic alignment. *Information Systems Research*, *8*(2), 125-150. https://doi.org/10.1287/isre.8.2.125

Chan, Y. E., and Reich, B. H. (2007). IT alignment: What have we learned? *Journal of Information Technology*, *22*(4), 297-315. https://doi.org/10.1057/palgrave.jit.2000109

Chi, M., Huang, R., and George, J. F. (2020). Collaboration in demand-driven supply chain: Based on a perspective of governance and IT-business strategic alignment. *International Journal of Information Management*, *52*, 102062. https://doi.org/10.1016/j.ijinfomgt.2019.102062

Departamento Administrativo Nacional de Estadística (DANE) (n.d.). *Censo nacional de población y vivienda 2018*. https://www.dane.gov.co/index.php/estadisticas-por-tema/demografia-y-poblacion/censo-nacional-de-poblacion-y-vivenda-2018/informacion-tecnica

Darii, H., Laval, J., Botta-Genoulaz, V., and Goepp, V. (2020). *Measurement of the Business/IT Alignment of Information Systems* [Conference presentation]. International Conference on Information Systems, Logistics, & Supply Chain, Austin, TX, USA. https://publis.icube.unistra.fr/docs/14252/ILS2020_final_HD_JL_VBG_VG.pdf

de Haes, S., and van Grembergen, W. (2009). An exploratory study into IT governance implementations and its impact on business/IT alignment. *Information Systems Management*, *26*(2), 123-137. https://doi.org/10.1080/10580530902794786

Duhamel, F., Gutiérrez-Martínez, I., Picazo-Vela, S., and Luna-Reyes, L. F. (2021). Strategic alignment, process improvements and public value in public-private IT outsourcing in Mexico. *International Journal of Public Sector Management*, *34*(5), 489-507. https://doi.org/10.1108/IJPSM-07-2020-0183

Gartner (n.d.-a). *Infographic: top priorities, technologies and challenges for healthcare providers in 2023*. https://www.gartner.com/document/4020356?ref=solrResearch&refval=406134615&

Gartner (n.d.-b). *It's time for healthcare delivery organizations to adopt a digital-first strategy*. https://www.gartner.com/document/3988796?ref=solrResearch&refval=406134858&

Ghonim, M. A., Khashaba, N. M., Al-Najaar, H. M., and Khashan, M. A. (2020). Strategic alignment and its impact on decision effectiveness: A comprehensive model. *International Journal of Emerging Markets*, *17*(1), 198-218. https://doi.org/10.1108/IJOEM-04-2020-0364

Gutiérrez, A., Mylonadis, C., Orozco, J., and Serrano, A. (2008). *Business-IS alignment: Assessment process to align IT projects with business strategy* [Conference presentation]. AMCIS 2008. http://aisel.aisnet.org/amcis2008/290

Gutiérrez, A., Orozco, J., and Serrano, A. (2009). Factors affecting IT and business alignment: A comparative study in SMEs and large organisations. *Journal of Enterprise Information Management*, *22*(1/2), 197.

Haghighi Rad, F., and Rowzan, S. M. (2018). Designing a hybrid system dynamic model for analyzing the impact of strategic alignment on project portfolio selection. *Simulation Modelling Practice and Theory*, *89*, 175-194. https://doi.org/10.1016/j.simpat.2018.10.001

Hart, M., and Burke, J. (2020). An exploratory study on the Devops IT alignment model. *Interdisciplinary Journal of Information, Knowledge & Management*, *15*, 127-154. https://doi.org/10.28945/4595

Henderson, J. C., and Venkatraman, N. (1993). Strategic alignment: Leveraging information technology for transforming organizations. *IBM Systems Journal*, *1*, 4.

Issa, A., Hatiboglu, B., Bildstein, A., and Bauernhansl, T. (2018). Industrie 4.0 roadmap: Framework for digital transformation based on the concepts of capability maturity and alignment. *Procedia CIRP*, *72*, 973-978. https://doi.org/10.1016/j.procir.2018.03.151

Luftman, J. (2000). Assessing business-IT alignment maturity. *Communications of the Association for Information Systems*, *4*(1), 14. http://aisel.aisnet.org/cais/vol4/iss1/14

Luftman, J., Lyytinen, K., and ben Zvi, T. (2017). Enhancing the measurement of information technology (IT) business alignment and its influence on company performance. *Journal of Information Technology*, *32*(1), 26-46. https://doi.org/10.1057/jit.2015.23

Luftman, J. (Ed.). (1996). *Competing in the Information Age: Strategic alignment in practice* (1st Edition). Oxford University Press.

Ministerio de Salud (2018). *Manual de acreditación salud ambulatoria y hospitalaria*. https://www.minsalud.gov.co/sites/rid/Lists/BibliotecaDigital/RIDE/VS/PSA/manual-acreditacion-salud-ambulatorio.pdf

Maciá Pérez, F., Berna Martinez, J. V., and Lorenzo Fonseca, I. (2021). Strategic IT alignment projects. Towards good governance. *Computer Standards & Interfaces*, *76*, 103514. https://doi.org/10.1016/j.csi.2021.103514

Miyamoto, M. (2019). *IT-business alignments among different divisions of Japanese corporations* [Conference presentation]. 2019 International Conference on Artificial Intelligence in Information and Communication (ICAIIC), Okinawa, Japan. https://doi.org/10.1109/ICAIIC.2019.8669032

Nebati, E. E., Ayvaz, B., and Kusakci, A. O. (2023). Digital transformation in the defense industry: A maturity model combining SF-AHP and SF-TODIM approaches. *Applied Soft Computing*, *132*, 109896. https://doi.org/10.1016/j.asoc.2022.109896

Patterson, M. (2020). A structured approach to strategic alignment between business and information technology objectives. *South African Journal of Business Management*, *51*(1). https://doi.org/10.4102/sajbm.v51i1.365

Reich, B. H., and Benbasat, I. (2000). Factors that influence the social dimension of alignment between business and information technology objectives. *MIS Quarterly*, *24*(1), 81-113.

Sabherwal, R., and Chan, Y. E. (2001). Alignment between business and IS strategies: A study of prospectors, analyzers, and defenders. *Information Systems Research*, *12*(1), 11-33. https://doi.org/10.1287/isre.12.1.11.9714

Sabherwal, R., Sabherwal, S., Havakhor, T., and Steelman, Z. R. (2019). How does strategic alignment affect firm performance? The roles of information technology investment and environmental uncertainty. *MIS Quarterly, 43*(2), 453-474. https://doi.org/10.25300/MISQ/2019/13626

Secretaría de Salud del Meta (n.d.). *Análisis de situación de salud VIllavicencio 2019*. http://www.villavicencio.gov.co/Documents/AN%C3%81LISIS%20DE%20SITUACI%C3%93N%20DE%20SALUD%20VILLAVICENCIO%20A%C3%91O%202019.pdf

Sholihah, M., Maezono, T., Mitake, Y., and Shimomura, Y. (2019). PSS strategic alignment: Linking service transition strategy with PSS business model. *Sustainability*, *11*(22), 6245. https://doi.org/10.3390/su11226245

Silva, R. P., Saraiva, C., and Mamede, H. S. (2022). Assessment of organizational readiness for digital transformation in SMEs. *Procedia Computer Science*, *204*, 362-369. https://doi.org/10.1016/j.procs.2022.08.044

Strategic Direction (2019). Manufacturing capabilities and performance improvement: How strategic alignment can deliver a lasting competitive edge. *Strategic Direction*, *35*(5), 25-27. https://doi.org/10.1108/SD-02-2019-0031

Smaczny, T. (2001). Is an alignment between business and information technology the appropriate paradigm to manage IT in today's organisations? *Management Decision*, *39*(10), 797-802. https://doi.org/10.1108/EUM0000000006521

Tarafdar, M., and Qrunfleh, S. (2009). IT-Business Alignment: A Two-Level Analysis. *Information Systems Management*, *26*(4), 338-349. https://doi.org/10.1080/10580530903245705

Torres-Moreno, M. E., and Aponte-Melo, J. H. (2021). Assessing business-IT alignment maturity at a Colombian university. *Journal of Cases on Information Technology* (*JCIT*), *23*(4), 1-22. https://doi.org/10.4018/JCIT.20211001.oa8

Lisienkova, T. S. (2017). Evaluation of Business and it strategic alignment maturity in Russian companies. *Вестник Южно-Уральского Государственного Университета. Серия: Компьютерные Технологии, Управление, Радиоэлектроника*, *17*(2), 2. https://cyberleninka.ru/article/n/evaluation-of-business-and-it-strategic-alignment-maturity-in-russian-companies-1

Yin, R. K. (2010). *Qualitative research from start to finish* (1st ed.). The Guilford Press.

Zee, J. T. M. V. D., and Jong, B. D. (1999). Alignment is not enough: Integrating business and information technology management with the balanced business scorecard. *Journal of Management Information Systems*, *16*(2), 137-158. https://doi.org/10.1080/07421222.1999.11518249

Zeebroeck, N. V., Kretschmer, T., and Bughin, J. (2023). Digital "is" strategy: The role of digital technology adoption in strategy renewal. *IEEE Transactions on Engineering Management*, *70*(9), 3183-3197. https://doi.org/10.1109/TEM.2021.3079347

Zhu, X., Ge, S., and Wang, N. (2021). Digital transformation: A systematic literature review. *Computers & Industrial Engineering*, *162*, 107774. https://doi.org/10.1016/j.cie.2021.107774