COMPLEX THINKING AND THE PROJECT PORTFOLIO IN PHILANTHROPIC HEALTH INSTITUTIONS

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Abstract: Working within a highly volatile scenario and subject to numerous interrelationships, institutions in the philanthropic healthcare sector must navigate both the efficiency and flexibility, characteristic of private entities, while retaining the focus on the purpose of social equity, typical of public entities. This dichotomy renders the implementation of a project portfolio a significant challenge. It was in recognition of the inherent features of this scenario that this research grounded its development in complex thinking. This allowed for learning rather than the imposition of pre-determinism, and critical reflection instead of hypothesis testing. Given the systemic nature of this research, the Soft System Methodology was chosen as the approach. Conducted within a philanthropic institution dedicated to oncological treatment, this unique case study originated from comprehending the organizational context through the lens of complex thinking to formulate an action plan centered on the implementation and management of a project portfolio. The outcomes demonstrated that steering this process guided by complex thinking enables greater flexibility and agility in project selection, as well as enhanced integration among stakeholders, along with reduced maturation time in the initiation and planning phases. On the other hand, this adoption opens discussions about the challenges of employing a holistic line of thought within a culture rooted predominantly in the positivist paradigm.

Keywords: Complexity; Philanthropy; Oncological Healthcare; Systemic Thinking; Project Portfolio

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Introduction

The interdependence between beings and the environment is no longer a simple epistemological inquiry, nor does it constitute a new paradigm that needs validation. This more systemic logic extends to organizational management, associating businesses no longer with machines, but with living beings. Thus, its description advocates the identification and understanding of the relationships it maintains with the actors and the environment in which it is inserted (Ackoff, 1999; Ackoff et al., 2006; Capra, 1982; Morin, Le Moigne, 1992; Ocelotl, 2021; Senge, 2017).

Through this more contextual bias, management must become more aware and responsive to changes in the environment. These changes impact them at an increasingly accelerated pace, forcing them to rethink both the way they understand themselves, their surroundings and interactions. As a result, maximization and optimization give way to learning and purpose, problems become problem situations and management becomes investigations (Kreher, 1995; Laloux, 2015; Serva, 1992).

Under this paradigm, the management of investments that translates into the project portfolio must both incorporate knowledge that focuses on learning, rather than predicting the future, and embrace the complexity of its context as a way to evolve and thrive (Laloux, 2017; Morecroft, Sterman, 1994; Wood Jr., 1993; Whitty and Maylor, 2009).

This understanding is based on the premises of complex thinking, which inserts aspects previously considered problematic into the discussion of management. In this sense, their multiple network interactions and uncertainties become functional premises, and errors or deviations are no longer to be avoided (Barros et al, 2000; Lafleur, 1996; Thamhain, 2013).

Therefore, the union between this school of thought and project management can be used to better manage your investments, and your tools, techniques, and practices assertive options for leadership in the health area (Brasil, 2023c; Ju Y, 2012; Sloane et al., 2003; Gomes et al.; 2003, Rhodes et al., 2012).

The use of complex thinking in healthcare is becoming increasingly common. Several

initiatives can be found, such as in the studies carried out by Lotfi (2023) that deals with the complexity of networks, by Majeed et al (2023) that use it as a success factor, by Nason (2023) and Long et al (2018) who directed their research to the difficulties of its use, by Mahmoud et al (2022) who used it in the decision-making process, and Colldén (2022) and its focus on contextual continuous improvement.

An important aspect in its use is the difficulty of evaluating the impact and interaction between multiple projects and the adoption of techniques that allow for a more agile maturation in the face of sudden and unexpected changes, as a result of the high political influence and the difficulty in raising resources typical of health (Berssaneti and Carvalho, 2015).

In line with these characteristics, this study demonstrates its relevance for its novelty in applying the bases of complex thinking and project management to develop a portfolio of projects in the area of philanthropic health, although there are initiatives of this alignment in other areas (Aritua et al, 2008; Baccarini, 1996; Chapman, 2016; Tarhan, 2016; Checkland, 1972; Tomé et al, 2016; Thomas and Mengel, 2008).

Based on the above, the objective of this study is to analyze the impact of complex thinking on the development and implementation of a portfolio of projects in the area of philanthropic health from three aspects: multiple interactions, network dynamics and uncertainties.

Material and Methods

The research is characterized as exploratory and descriptive due to the need to approach the subjects of the study, and the identification of more current research related to the topics addressed (Gil, 1999; Vergara, 2005).

As for the methodology, it was guided by the "Soft System Methodology [SSM]" because it is aligned with the constitutive premises of an Action Research [PA] and is the most recognized, employed and cited. In addition, it allows both the evolution of the study guided by learning and the focus on the generation of knowledge in contexts whose problem is not totally clear and defined,

as well as the inclusion of new ideas after criticism, according to Checkland (1981), Checkland and Poulter (2006), Mingers and Rosenhead (2004).

Consequently, a study that proposes a bias typical of complex thinking needs to use a methodology developed under such premises at the risk of becoming biased if it is conducted by a more reductionist one, Castellani and Rajaram (2021).

Its stages were developed through a cyclical process of planning, action and review, where ideas are used in a methodology to study an area of interest, and where themes must replace hypotheses. Thus, a structure of ideas [F] was incorporated into a methodology [M], to investigate an area of Interest [A], whose dynamics changed the linear logic of validation of a hypothesis in the more traditional molds of research, constituting much more as a continuous process of review and improvement in the face of collected data, perceived interferences, interactions and unscheduled changes, as advised by Checkland and Holwell (1998).

Consequently, the elements of investigation and the problem that this study sought to clarify, as well as its stages of development, followed the cycles exposed in Figures 1 and 2 referenced below.

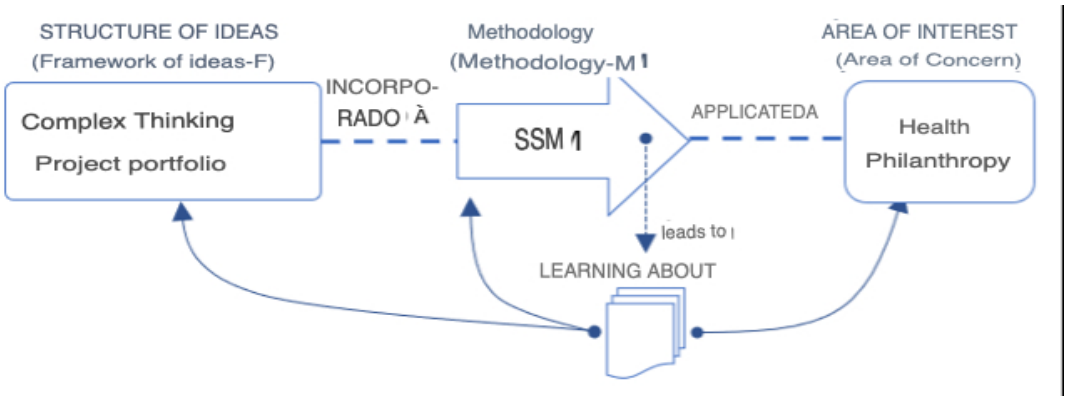

Figure 01: Initial elements of the investigation: theoretical basis

Source: Adapted from (CHECKLAND; HOLWELL, 1998)

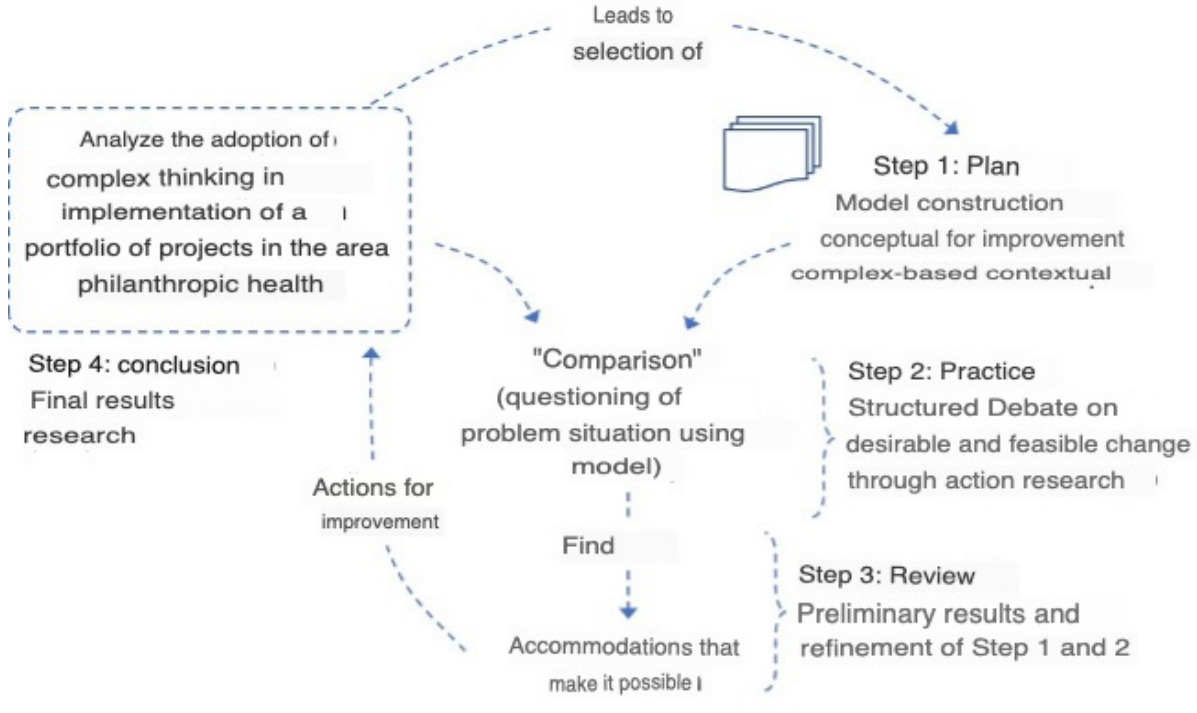

Figure 02: The project's problem and its evolution and learning cycle

Source: Adapted from (Checkland and Holwell, 1998)

For data collection, internal documents were used, as well as research in articles and books and on the websites of government regulatory agencies, as well as seminars and unstructured interviews with the institution's decision-makers in accordance with the premises of an AP (Thiollent, 1997).

In addition, cycles of criticism and review after each stage were carried out as a way to consolidate knowledge along the lines proposed by Rau and Koch-Gonzalez (2018), as these data collection techniques allow the inclusion of more subjective aspects when the use of determinisms alone does not allow a clarification of their complexity (Checkland, Poulter, 2006).

As stages, this research presented:

STEP 1: Research plan and construction of the conceptual model

As recommended for the learning cycle outlined for the research in Figure 2, the first stage consisted of the characterization of its context, already in the molds of SSM, as listed below.

The company that is the focus of the study and the philanthropic context

The institution in focus has been working in the area of philanthropic health for almost eight decades with the challenge of combining high-standard oncological care with high accessibility.

In accordance with Law No. 12,101/2009, Brazil, (2009a), there is no fixed or specific value regarding the minimum percentage of free patient care. However, it is up to them to provide proof of services at the minimum level of 60% aimed at the Unified Health System [SUS]. In addition, the institution is recognized by the Ministry of Health as a "High Complexity Center in Oncology [CACON]" and classified as a "Civil Society Organization of Public Interest [OSCIP]".

This classification forces it to deal at the same time with efficiency and flexibility, typical of private systems, without losing focus on the purpose of social equity, typical of public entities. However, this duality is not consensual. Sectors of the government see the philanthropy typical of large institutions as a mere artifice to name the thing private, being, therefore, a mechanism to enjoy tax benefits while consolidating profitable businesses in their services (Ribeiro, 1993).

As almost half of all health care in the country is provided through philanthropy, Brazil (2021b), it was observed that, despite the legal classifications, these organizations play a fundamental role in maintaining the health system. This characterizes it as being typical of the third sector, that is, one that has a symbiotic relationship between the public and the private (Paes, 2001).

The complex network of financing its operations comes from various sources, mainly from private initiatives, although there is undoubtedly participation of the state, either by directing funds or by exempting fees and taxes. This reveals a dynamic where there are no guarantees, implying a complicated game of interests for its managers and forcing it to base its investments not so much on its strategy, but on the availability of funds and political interest (Weber, 1999; Coimbra, 1986).

With regard to its capitalization, the charging of services to the portion of the population that can afford it is not disregarded, thus combining voluntarism and business in a mix of practices consistent with the characterization of Coimbra (1986). This charge has become a necessity for survival, as the SUS transfer table has not been updated for more than twenty years, Brazil (2019c), making it even more difficult to manage its operations.

Even in the face of these challenges, the company grew and included teaching and research in its services. This form of broadening the scope of its functions took it out of the more spiritualist and welfare bias of its foundation and characterized it more as focused on hospital medical care (Ivamoto et al, 1998).

In view of the strong growth of recent years, the institution felt the need to structure its portfolio of projects, starting a first and failed attempt. This attempt whose main factor of friction and stress was related to the incongruity of the choice of assumptions, techniques and deterministic tools arising from the traditional management of predictive projects in an institution whose context is characterized by extreme dynamics, subject to chaotic political and social influences, and whose strategic and operational culture was built by health professionals who did not necessarily have knowledge about the premises of development of a complex project, therefore not even the inherent needs for portfolio management.

After rethinking his strategy, a second attempt to implement a project office and the development of his portfolio began. This second initiative was outlined through this research.

Problem modeling

To contextualize both the problem context and the institution in relation to the philanthropic health area, the CATWOE mnemonic was used, which is recommended by the SSM itself, and which includes clients, actors, transformation, worldview, owner, and environmental restrictions (Checkland, 2000; Rose, 1997).

As a way of enriching its use and filling possible gaps, such as a possible counterintuitive rigidity in learning or the ambiguity of understanding the meaning of the terms (Checkland, 2000; Bergvall-karenborn et al, 2004; Basden; Wood-Harper, 2006; Mingers, 1992), its use was based on revisions that combine it with other techniques such as "strategic assumption surfacing and testing [TAST]" and "critical systems thinking [CST]" (Bergvall-karenborn et al, 2004; Basden; Wood-Harper, 2006) as a way of minimizing distortions of comprehension. Therefore, the mnemonic was understood as:

- Customers: all those affected by the transformations (positively or negatively), with a focus on those with the power to influence;
- Actors: those responsible and with the competence to operationalize the transformations (including the competences they lack);
- Transformation: inputs and outputs in terms of process, including auxiliary processes related to the transformation;
- Worldview: multifaceted qualifying function that imprints meaning to transformation;
- Owner: those with the power to stop transformation, including aspects of dependencies that hinder action;
- Environmental Restriction: elements that act as barriers, restricting the functioning of the system (including legal, institutional and normative aspects – internal and/or external).

To facilitate and pacify the mnemonic information, a cycle of influences was built whose critical aspects were debated in rounds of arguments between those involved (board, infrastructure and operations management) with the objective of both anticipating problems and minimizing risks inherent to the implementation of the portfolio.

This cycle was built in accordance with the systemic understanding for problem situations proposed by Senge (2017) and Ackoff (1999). In addition, its construction led to the constant exercise

of monitoring dynamic forces, that is, interconnected patterns that shape the behavior and results of a system over time and that influence its results.

As the cultural factor demands an unpredictable time to present changes, the construction of this cycle would allow those involved a shared criticism instead of pointing out the culprits in moments of future resistance (Senge, 2017).

The choice of model for project management

Given the characteristics of the institution and the recommendation for the hybrid format referenced by the Ministry of Health, Brazil (2023c), due to its inherent dynamics of systems whose modeling language describes complex systems, these models allowed the construction of cause-effect cycles to understand the critical interactions in projects and between projects, in addition to allowing the understanding of diverse effects caused by various influences, facilitating the management of their activities (Forrester, 1961; Abdel-Hamid and Madnick, 1991).

Another aspect that corroborated the hybrid approach concerns the characteristics of the projects developed at the institution. These projects involved multiple interrelated actors with a high degree of differentiation and interdependence (Baccarini, 1996); demanded a high capacity to respond to change and a high focus on learning, Hass (2009); drawing on the experience of the actors involved, Lima and Farias (2012); and involving multiple actors with diverse objectives, Davis, MacDonald, & White (2010); in addition to demanding an approach that would unite several practices in favor of a personalized and iterative model (Conforto et al, 2015).

That said, two maturity models were selected: the "Organizational Project Management Maturity Model [OPM3]", conceived and launched by the "Project Management Institute [PMI]" as a progressive organizational maturity model developed from aggregated and interconnected knowledge that focuses on three central domains: the project, the program or the portfolio (PMI, 2003); and the "Adaptive Project Framework [APF]", developed to allow adaptation to constant and uncertain

changes in the scenario, with flexibility for changes to the model itself, from the schedule, through the budget, risks and planning stages in response to the characteristics of the project and the complexity of the interactions that involve it (Wysocki, 2010, 2016).

Some factors justified the previous choice for OPM3 and APF:

- The FPA has a strong foundation in complex thinking, as it inserts uncertainties and changes at the core of project management, making it an adaptive process in response to the scenario to which the projects will be implemented, thus demonstrating total alignment with the constitutive bases of this research and the focus institution (Wysocki, 2010);
- Developed from the organization's need to rethink and standardize its processes, OPM3 forces the actors involved to delve into standardization before planning and executing the project itself, according to PMI (2003). This direction proved to be fundamental for the institution, as it was only in mid-2021 that the work of mapping and standardizing its processes through "Lean" began, when the first attempt to structure its project sector also began;
- The existing projects, before the beginning of this research, mixed opportunities for improvement that advocated the review and standardization of their operational processes with others typical of more traditional and pre-deterministic projects, such as renovation, construction and expansion of new units, therefore, not allowing a uniform and standardized management;
- The cultural aspect of the institution and its resistance to a deterministic implementation had already represented obstacles and generated stress among decision makers, making the gradual implementation of "out of the box" knowledge (complex thinking and adaptive systems applied to projects) a more palatable option;
- Finally, the typical flexibility of these models allowed an alignment with the learning and

evolution cycles recommended in Stage 1 (Figure 2).

Thus, from the consideration of these models, it would be possible to determine the maturity phases and their deliverables, which through the choice of selection criteria would enable the selection of the projects allocated in the portfolio in alignment with the investment demands.

Modeling the portfolio

The characterization of the maturity phases for the projects was followed by the prioritization of opportunities. The objective was to guide the institution's management in the argumentation and debate with its funders, no longer guiding them solely by the political game of interests, but with a view to more mature projects and less subject to risks, therefore, following more consistent and technical criteria.

Among the various methods that characterize a "Multiple Criteria Decision Making [MCDM]", the "Analytical Hierarchy Process [AHP]" was chosen as the method to make this prioritization possible. This choice is due to the ability to analyze complex problems under different aspects, criteria and points of view, and to consider both objective and subjective preferences (Almeida, 2003; Bramont, 1996).

As variables for AHP, as advised by Saaty (1990, 2001), the following were suggested:

- Complexity: the scale proposed by the "Global Alliance for the Project Professions [GAPPS]" was used, which through a simple sum of questions categorizes the complexity of a project, (GAAPS, 2007). In it, five factors were evaluated, whose variation translated into 1 point (low influence), 2 (medium influence) and 3 (high influence):

F1. Number and relevance of actors involved

F2. Number of variables and interactions

F3. Technical, environmental and legal requirements

F4. Strategic importance of the project

F5. Financial impact

- Resources: subdivided into fully financed (+90% of the estimated value), partially financed (between 90% and 70%) and unfunded (below 70%);
- Impact: divided into funding, improvement and liabilities, corresponding respectively to projects that aim to increase revenue, improve operations or eliminate legal/labor liabilities (regulatory adequacy).
- Care: related to the impact of the project on the supply and operationalization of the service, subdivided into critical (impacts the perception of the patient/companion), partially critical (impacts the operational activity, without direct reflection on the patient) and non-critical (when the impact does not impact either the operation or the patient).

The ranges of variation of these parameters were validated in cycles of criticism in seminars with the main decision-makers of the board, operation and assistance. For each critical cycle, the AHP was recalculated and the changes in priority were observed until there was neither a change in the sequence of these parameters, nor an internal variation exceeding the range of 20% of the total (being 10% more or less).

It took three meetings for the sensitivity analysis process to meet the pre-defined standards. Thus, existing projects could be categorized by their maturity and ranked based on technical criteria.

Tools for portfolio management

Two criteria were considered for the choice of the tools listed here: all should be associated with the three characteristics determined in the objective of this study, and none of them should

replace the parallel use of tools and techniques from the APF and OPR3 models, but should be complementary to them.

As a theoretical framework for selecting these tools, the research used the Network Theory due to its alignment with complex thinking and the possibility of using the internal inequalities inherent to the network as beneficial aspects to its evolution, in addition to allowing the insertion of new nodes, leading to a dynamic component of connectivity that would allow its expansion (Barbarási, 2009).

In addition to these characteristics, robustness was also considered, that is, the ability to withstand stress and overcome difficulties without collapsing. Thus, the accumulation of advantages dispersed among its nodes would lead the network to present clusters as a form of organization. This clustering would minimize the spread of errors in the network and increase the efficiency in the exchange of information, since it would not be chaotic (long and random connections) enough for its complexity to hinder its evolution, nor too rigid (short and crowded connections) to the point of stress contaminating it completely (Barbarási, 2009; Staella and Lemos, 2010).

This understanding of networks allowed the selected techniques and tools to offer a more contextual, non-linear and interactive view of the projects allocated in the portfolio, avoiding that they were analyzed as isolated elements.

When the theory of networks encompasses the social factor, the Actor-Network Theory has the possibility of conceiving the sociology (study of homogeneous) of associations (study of heterogeneous). This led the study from the focus on the object, that is, on the product of the project, to the focus on the associations that would allow its conclusion. The result would be the understanding of the dynamics between the actors, enabling both the characterization, the evolution and self-organization of the network necessary for the evolution of the projects (Latour, 2012; Staella and Lemos, 2010).

Under this understanding, and in view of the determination of the deliverables for each phase of maturation for the projects, it was possible to make network maps whose objective was to understand the dynamics of informational exchange between the actors with decision-making power in relation

to their development. In addition, it would be possible to standardize their responsibilities with these actors, as well as to identify the informational flows for each phase of maturation, the occurrence of the absence of imposed centralized control, the autonomous nature and high connectivity between the subsystems, the non-linear causality, and an emerging decentralized control typical of complex systems (Barbarási, 2009; Staella and Lemos, 2010; Kauffman 1993).

In this sense, three networks were built. One focused on the interactions between the functional nodes (sectors) involved in the maturation of projects (systems level), another detailing the iterations between the deliverables of these nodes (subsystems level) and a last one focused on the interrelationships between variables within a project (subcomponent level) so that there was a deeper understanding of the portfolio interactions.

Finalizing the selection of tools, there was a need to evaluate the impact of the portfolio on the institution's operational centers. To this end, a Sankey Diagram was built where it was possible to identify the increase in work, in the form of flow, from the closure of the projects in the portfolio, as recommended by Riehmann et al. (2005), and which, associated with AHP, increased the assertiveness in the selection of new projects, now in response to the anticipation of future bottlenecks in the operational centers of the institution.

Figure 3 shows the construction logic used for the Sankey Diagram (Riehmann et al., 2005).

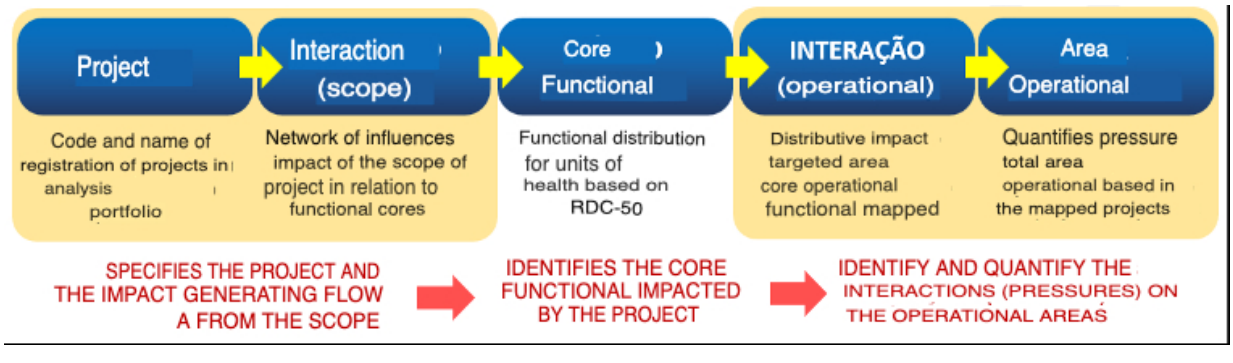

Figure 03: Sankey Diagram construction logic

Source: Adapted from (Riehmann et al., 2005)

Note: RDC-50 is a regulatory standard prepared by the Ministry of Health

Finally, it would be necessary to select the software that would allow the management of the portfolio. Thus, the use of Trello® and ClickUp were suggested®. The indication for these two alternatives was based on the researcher's experience of use and its inherent reduction in the learning time required for implementation.

Based on the mapped tools, the following action plan was prepared.

Table 1. Action plan for Stage 2 and 3 of the survey

SHARE	DEFINITION	HOW	EXPECTED RESULT
Contextual Characterization	Characterize influences for portfolio implementation	CATWOE Mnemonic (SSM base)	Contextual features
	Understand the critical influences for the portfolio	Systemic Cycle (dynamic forces)	Dynamics of influence in portfolio management
Maturation Model	Determination of ripening stages	OPM3 and APF base	Allocation of projects by maturity stage
	Determination of deliverables by phase	OPM3 Base, APF and Systemic Cycle	Stages and risks by maturity stage
Management Tools	Choice of management software	Selecting between Trello® and ClickUp®	Implementation of a management system for the portfolio
	Prioritization criteria	Application of AHP	Standardization and criteria
	Understand influence dynamics between projects	Network map (interactions)	Identify how projects interact with each other
	Understand informational dynamics between actors involved in the projects	Network map (interactions)	Pacify among those involved their responsibilities and influences
	Understand the dynamics of influence between maturation tools	Network map (interactions)	Learn to optimize efforts to increase results
	Identify areas with demand overload (future impact)	Sankey diagram	Identify which functional areas of the organization are impacted

Source: Original survey data

STEPS 2 and 3: Practice and refinement

Stages 2 and 3 following the development of the conceptual model for the portfolio and their respective consolidation actions took place simultaneously. Some aspects justify this simultaneity:

- The organizational dynamics and the already mature projects did not allow a cadenced implementation period typical of a more linear and sequential planning;
- Not all actions could be implemented to all projects due to their characteristics and limitations.

Thus, these joint stages sought to identify which projects allocated in the portfolio would be considered critical for the implementation of the plan (Table 1), and to determine how much this plan would be deepened, since some of its actions required an implementation period longer than the time of progress of the project already in the planning and execution phases.

STEP 4: Conclusion

The fourth and last stage of the research consisted of closing the SSM learning cycle and presenting the results obtained.

Results and Discussion

The results of the research are shown in accordance with the chronological order in which they were reached. Considerations about its results were made at the end of each stage in accordance with the logic of criticism and learning of SSM.

Contextual characterization

From the mnemonic provided for in the SSM, the influencing factors for the research context and for the implementation of the portfolio were identified, as shown in Table 2.

Table 2. Result for the CATWOE mnemonic

C CLIENTS	Primary: SUS and Ministry of Health (funders), private initiative (funders), supplementary patients (approx. 35% of care) and regulated patients (approx. 65% of care), public agencies directing funds, state and national politicians, business development partners (research), educational offer partners (teaching) Secondary: students and professors in the health area, patient companions, outsourced and volunteers of the institution, other oncological health institutions (state and national)
The ACTORS	Primary: official public managers directly responsible for the operationalization of federal public health policies, employees in the care area (including area managers and coordinators), business partner physicians Secondary: teachers and students, own staff, solution development partners, political representatives with power of influence (direct advisors), partner banks
T TRANSFORMATION MATION	Input: influencing factors in the contextual dynamics of project financing Output: portfolio of projects (opportunities) with a minimum degree of maturity for presentation in response to financing alternatives
W WORLDVIEW	Projects developed with the improvement of the experience of the patient and their families through normative and legal services that guarantee service excellence
Or OWNER	Primary: legislators and high-ranking members of the executive branch (state and federal spheres), society (population served via SUS), business partner physicians Secondary: society (supplementary population), health regulators
And ENVIRONMENT	Primary: lag in the SUS table of services hinders capitalization, incongruence between health standards (RDC family), public health policies (state and federal levels) Secondary: inconstancy of public focus on health (changes associated with elections) generating instability in the sector

Source: Original survey results

Based on the information collected through unstructured interviews and seminars with those involved, the mnemonic was modified to the format of a cycle of influences. The operational representative of the board, the infrastructure and assistance managers were involved.

Each round represented the contribution of an actor from their understanding of the connection

and sense of influence of these factors, until a consensus was reached and a cohesive alignment was achieved.

In the upper cycle, the reinforcements necessary to reach the study were listed and that, through refinement and continuous learning, would allow both the implementation and the evolution of the project portfolio. This cycle represented not a linear sequence of influence, but the systemic logic that connects them (Senge, 2017). In the lower cycle, the factors that would act as detractors to the objective were listed. This cycle was also built according to the dynamics of systems and their learning models (Senge, 2017).

The analysis of these cycles represented the cultural context (factors) of positive and negative influence for the success of the research, and served as a reference for those involved to understand that the desired results would only be possible if these factors were considered.

Considerations

The story told by the cycles, Figure 4, revealed which factors are critical to the implementation of the portfolio. These factors should not be understood as causes in themselves, but as influences that demand attention and care in the face of each planned action. Therefore, there is no direct or causal link from one to one, but from several to several, Capra (1982).

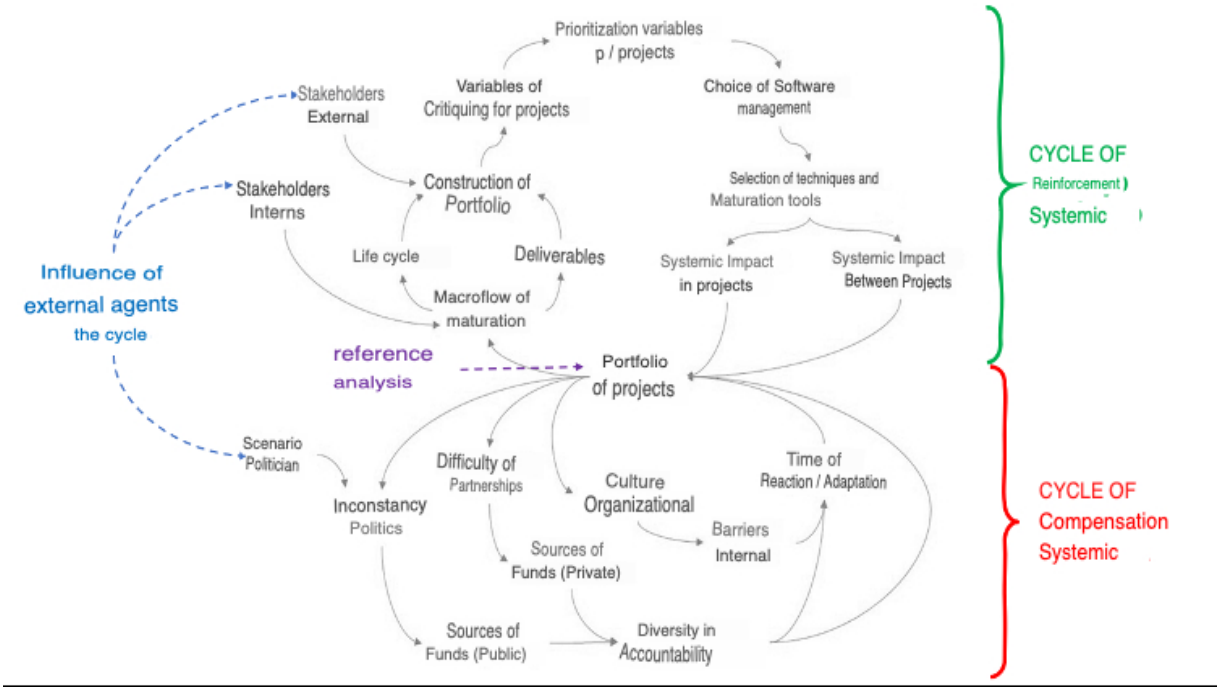

Figure 04: Systemic cycle (reinforcement and compensation)

Source: Original survey results

Maturity model and its deliverables

Immediately after the definition of the cycle, there was a period of study regarding the OPM3 and APF models that resulted in the determination of the maturity phases, and their respective deliverables, for the institution's project portfolio. It should be noted that none of these models were fully followed, but considered as a basis for the development of a hybrid model that was more assertive to the reality of the institution.

As it is a more technical process, only the researcher, the director and the operational manager participated in this methodological comparison.

The result of this analysis is shown in Table 3 below.

Table 3. Maturity phases and phased deliverables for projects

PHASE	DELIVERABLE	QNT*
DEMAND	D1. Project Charter: Definition of scope + objectives + goals + systemic interactions D2. Estimated area (m²) D3. Classification and prioritization of the project in the portfolio (AHP) D4: Estimated costs per m² (only work) D5: Estimated time and execution stages	35
INITIATION	I1: Zoning and architectural pre-design I2: Impact estimation (scope) + changes I3: Review of cost estimation (includes acquisitions) I4: Identification of legal documentation I5: Identification of complementary projects	14
PLANNING	P1: Reaction plan (changes) P2: Architectural and complementary executive design P3: Operational opening plan (commissioning) P4: Procurement plan P5: Breakdown structure (when applicable) P6: Docs. legal (opening of cases	5
EXECUTION	E1: Impact monitoring (scope) + changes E2: Architectural executive project E3: Opening plan E4: Procurement plan E5: Legal documents (processes) E6: Complementary executive projects	21
CLOSURE	N1: As-built projects N2: Data book (equip. and building) N3: Term of delivery N5: Indicators + Settlement	4

Source: Original survey results

NOTE: *Number of projects considered active allocated to each phase

As there is no standardization of nomenclature between OPM3 and APF, the concordances between the two models were analyzed with regard to: approach to the maturity phases, gain of experience throughout the evolution of the project; gradual evolution as a premise for increasing value; and the possibility of fractional deliveries (agility).

This definition made it possible to allocate existing projects within a standardized maturation logic, which did not exist before, in addition to allowing those involved a glimpse of their roles and obligations in each phase. It also allowed the development of the first draft of the project portfolio for the institution and the measurement of the efforts necessary for the continuity of its activities, which had been stopped since the pause in the implementation of the project office.

Considerations

Although it was not the focus of this study, the macroflow of actions was restructured for the evolution of the projects in respect to the defined maturation phases. This delineation of steps was fundamental for the future construction of network maps.

Consequently, the basic structure of the portfolio was selected, the management system. This selection was scheduled for a future moment in the research plan, however, it was requested by the board of directors to implement it ahead of schedule as a way of disseminating and facilitating access to information. Thus, due to the researcher's previous knowledge, ClickUp® was the system selected, and as soon as implemented, loaded with basic information and about the projects in their respective maturation phase.

However, it was observed that the necessary and subsequent prioritization activity for the projects could not be extrapolated to all phases, being restricted to the projects allocated in the Demand phase. This restriction made it possible for the projects allocated in the following stages not to have their execution order changed in view of the new criterion, which would imply sudden and costly changes in work and increased costs.

This definition implied a radical change with the management regarding its position in relation to the continuity of investments. Historically, there was a change in the destination of funds, even in mature projects, hindering their execution and paralyzing them, with a consequent increase in operating costs. The repositioning was positive, as the project office can, from this moment on, plan,

execute and finalize projects already started before a new initiative.

Prioritization criteria for projects

Consequently the allocation of projects and according to the definitions of the maturation phases, the definition of the prioritization criteria for the portfolio began. These criteria were presented and settled with the directors of the institution through three stages:

- Definition of the hierarchical structure with criteria and alternatives by level;
- Comparison of alternatives, pairing and sensitivity analysis;
- Normalization, weight calculations and prioritization of projects in the portfolio.

The results of the sensitivity analysis for the defined parameters were, respectively: Impact (48%), Resources (30%), Assistance (15%) and Complexity (7%).

Based on these variables, the projects in the demand phase were ranked.

Considerations

Despite the initial results, some factors pointed out as detractors in the systemic cycle proved to be critical and present, impacting the totality of the use of AHP.

A culture consolidated for more than seven decades would not suddenly change, even in the face of the consensual adoption of validated techniques. The consolidation of variables as criteria for analysis and prioritization came up against the inherent difficulty of changing the posture in the dynamics of investment selection.

Complex network maps

In alignment with the Network Theory, groupings, or nodes, were identified that allowed us to understand how the demands for projects were aligned with the organizational strategy. There was also the consolidation of the flow of information necessary for its maintenance, as well as the identification of the risks related to each stage. These interactions led to the self-regulation of the system, i.e. the integrity of the portfolio.

Thus, instead of determining risks mapped in the linear format of cause and effect, there was an understanding of how disturbances in the network influenced the portfolio. The focus, therefore, shifted from the control of variables to the management of influences, which began to be analyzed in terms of disturbance, the impact of which generated uncertain and chaotic emergent states that demanded greater or lesser attention.

While Figure 5 reveals the dynamics that associate the demand for projects with the institution's strategy, making it possible to understand the system of influences that connects them (organizational sectors involved), Figures 6 and 7 reveal the functional nodes and their macro network of interaction and informational flows (subsystems and critical components, whose product was characterized as a deliverable to the project).

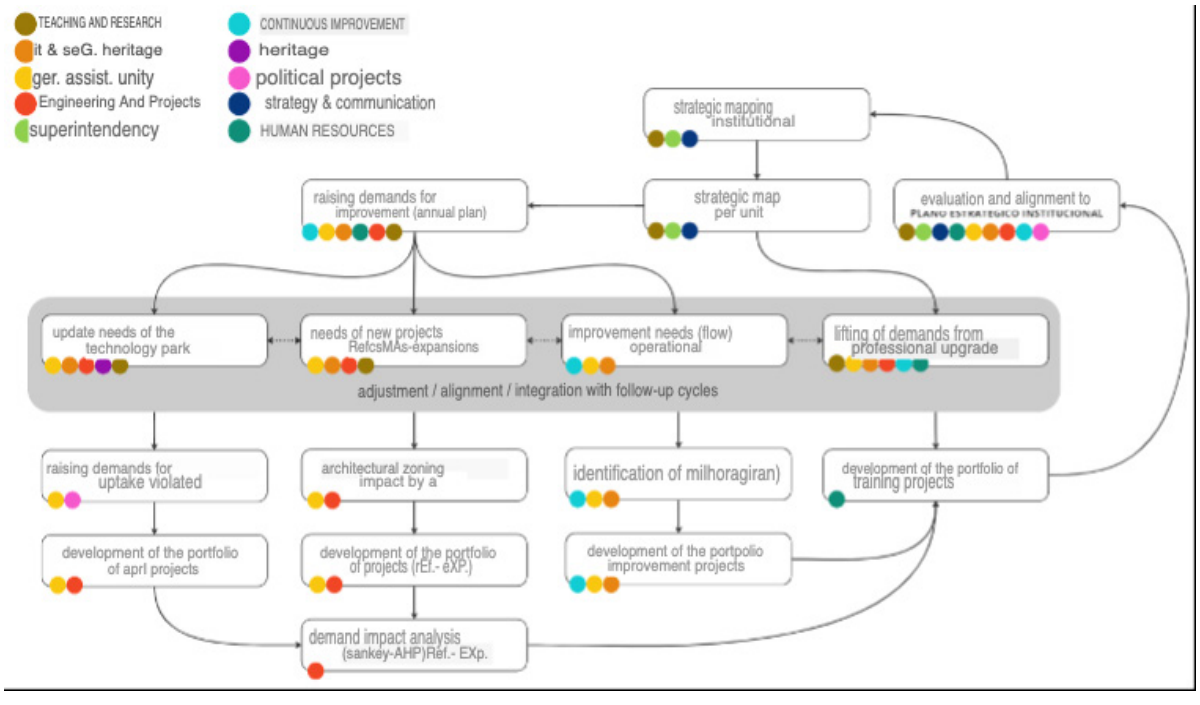

Figure 5: Strategic network map for the demand for projects (systems)

Source: Original survey results

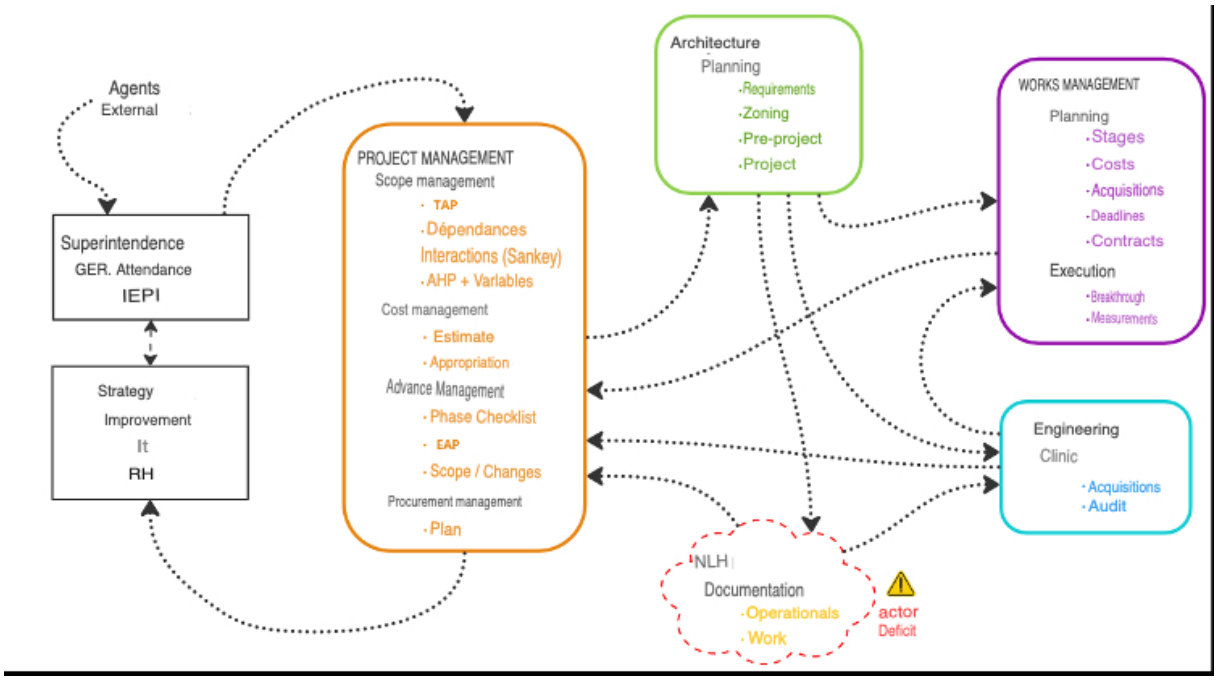

Figure 6: Network map and cluster identification (subsystems)

Source: Original survey results

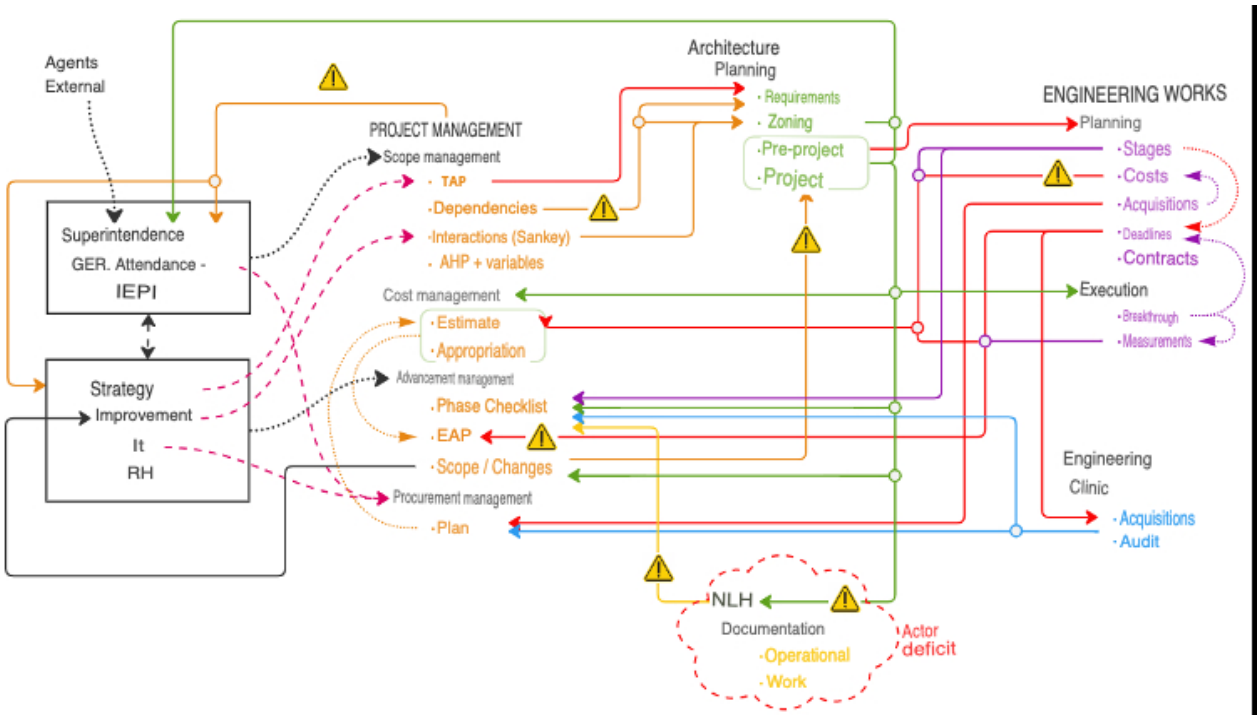

Figure 7: Breakdown of the network for portfolio management (subsystems and components)

Source: Original survey results

These maps made it possible to see impacts on a multilevel scale, making it possible to see which deliverables would be harmed if a problem was noticed in a given node. Special attention is paid to the NLH - Hospital Licensing Center, a deficit node given its newly defined operational premise regarding the survey of legal and normative documentation that must be met by the projects.

This same logic of network analysis became part of the development for projects whose evaluation by the GAPPS premises achieved the highest scores. Thus, these projects had their nodes mapped so that their critical interactions could be evaluated by those involved (designers and managers) in their maturation (evolution and risks).

Figure 8 reveals the map of interactions of the Access Control component of Project X based on the disciplines involved in the complementary projects contracted.

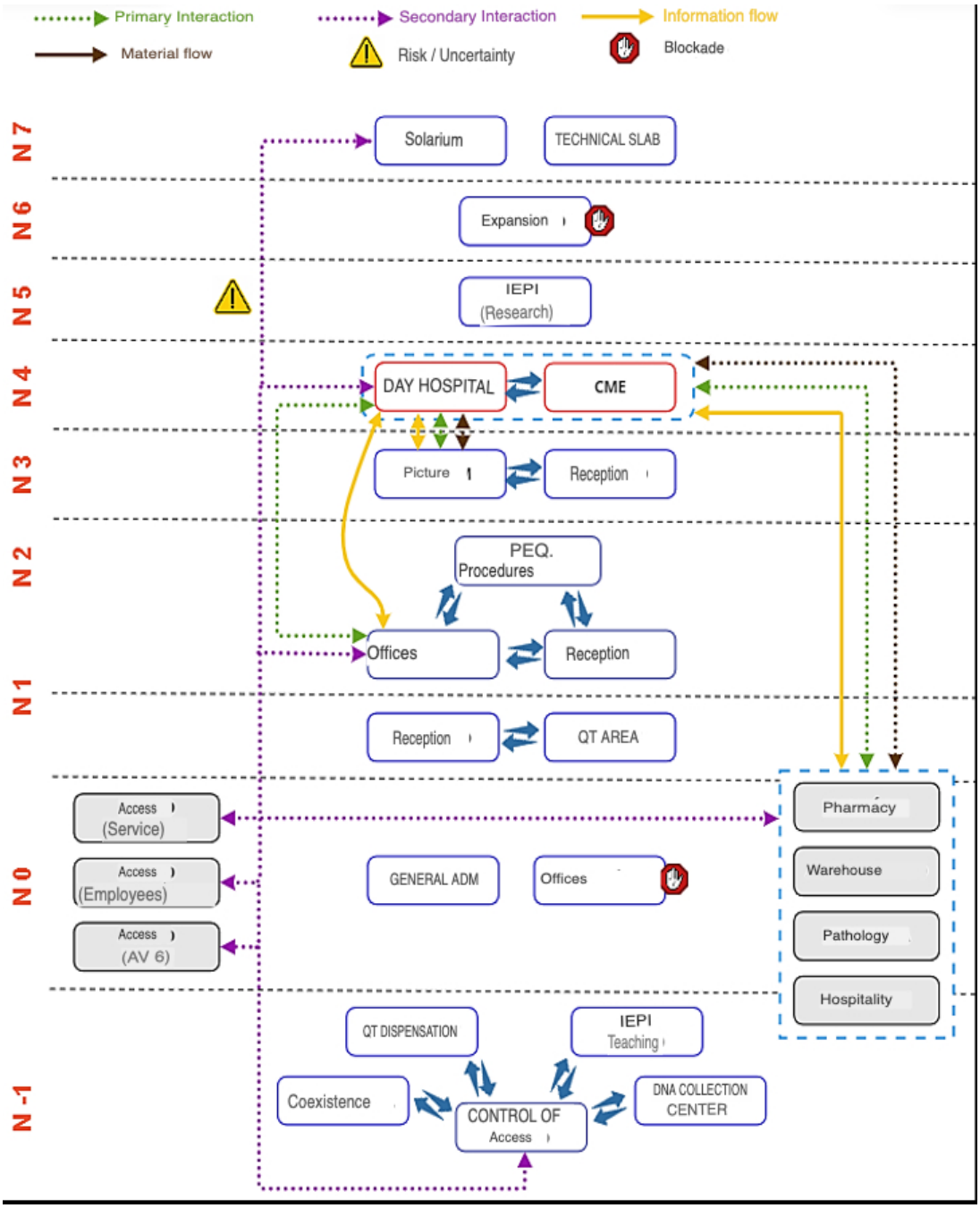

Figure 8: Operational interaction map for the “accesses” node in project x

Source: Original survey results

Considerations

Because it is easier to understand which words, relational figures are more effective in transmitting ideas, as Checkland (2000) and Ackoff (2017) attest. This use, recommended by SSM and Network Theory, proved to be fundamental for the institution to absorb premises of complex thinking in a more organic way.

The construction of these maps only for complex projects does not contradict the result of the prioritization and criteria listed by AHP. The level of complexity, even configuring low influence as a selection criterion, did not eliminate its observance in some projects, since AHP ranked projects in terms of gains. That said, a project may not be ranked as a priority by AHP, but require a network analysis in its maturation stages due to the GAPPS classification.

Identifying areas impacted by projects

After the implementation of the network maps for the projects qualified as complex, the research proceeded with the identification and ranking of the functional areas that would be impacted in a given time window.

By determination of the operational board, a two-year window was considered.

All projects were evaluated in relation to the following question: this project will cause an increase in service in which areas? If a certain operational area was impacted, grade one would be assigned to it. If not, the score zero.

In a seminar with the participation of the operational board, and assistance and engineering management, all the projects allocated in the portfolio were evaluated in relation to the aforementioned issue. The sum of points awarded allowed the construction of the Sankey Diagram.

This diagram did not assess the intensity of the impact, since this assessment required criteria, flow analyses and specific operational capacities that could only be effective when the projects were

closed and their gains validated (status indicators). However, there was an assessment of whether this impact occurred. Aware that intensity could drastically alter the ranking, the development of the diagram would only make it possible to identify which areas would be overloaded as the projects allocated in the portfolio were completed.

This diagram, therefore, was considered as an additional secondary information whose objective was to allow us to see the increase in services in the functional centers of the institution and to guide the realization of more detailed studies by the continuous improvement and controllership sector, responsible for the feasibility studies.

Figure 9 shows the Sankey Diagram elaborated for the project portfolio. In it, highlighted in red, it is possible to identify the project causing the greatest impact, followed respectively by the second, in orange, and third, in yellow. The other projects did not present impacts considered relevant by those involved, although their evaluation contributed to the formulation of the diagram.

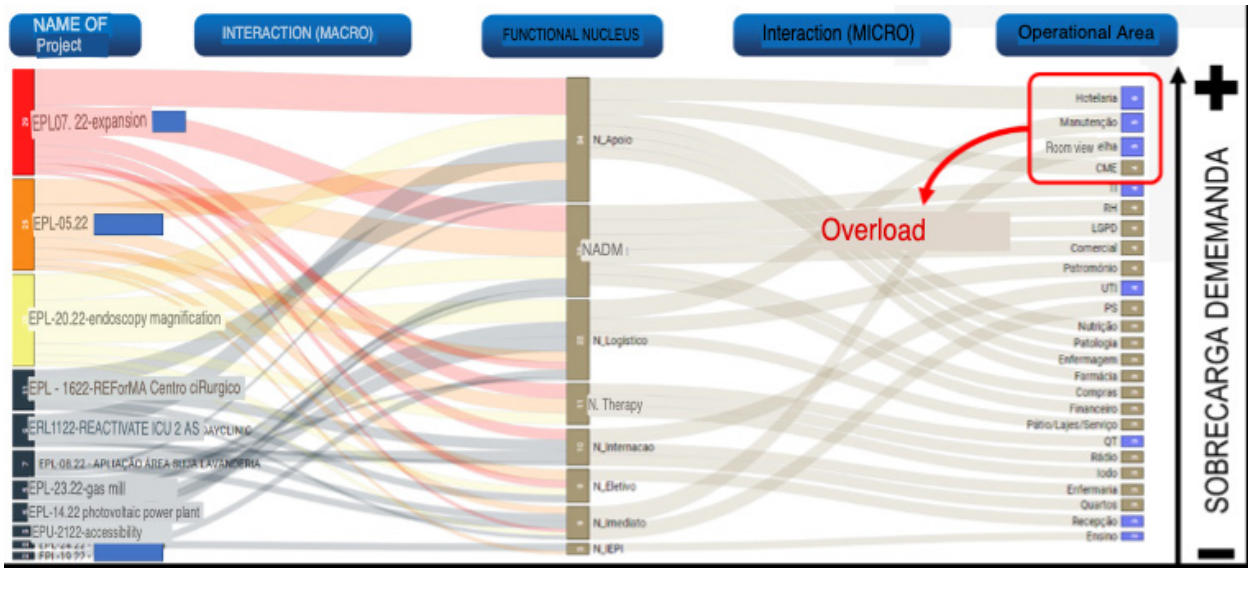

Figure 9: Sankey diagram for complex projects allocated in the portfolio

Source: Original survey results

Note: The name of some projects has been withheld for confidentiality

Considerations

The use of the Sankey Diagram enabled an unprecedented analysis for the institution's decision-makers, because, even if the intensity of the impact was not included, its preparation represented an unprecedented alignment of visions, based on the expertise of the operational and strategic staff. Thus, its elaboration shed light on which functional nuclei, until then considered secondary and normally ignored, would undergo an increase in their services.

End-of-results analysis

The analysis proposed by the objective of this study was carried out based on the three aspects listed, highlighting the following results:

Regarding the use of complex thinking:

- Identification of critical stakeholders to the projects in the form of systemic maps facilitated the understanding and importance of adopting complex thinking;
- Greater understanding of the dependencies between those involved who were able to visualize the impacts of their actions on the mapped network;
- Greater management over deficit nodes, including their communication channels, as a way to minimize risks related to the critical information flow to projects;
- Increase of more than 350% in the number of projects in execution in the portfolio, related to the implementation of the maturation flow and determination of deliverables;
- Reduction of 44% in the time dedicated to the preparation of architectural projects, which were directed more assertively from the maturation of the project (prerequisite engineering) and no longer as the start of the development process;
- Reduction of 35.2% in the preparation time of complementary projects, from the holding

of seminars with designers with the objective of listing impacts between their disciplines.

When observing the adoption of network maps, it was possible to list:

- Understanding of the interdependencies that impact management, maturation and risks linked to projects;
- Network map for architecture made standard for complex projects allowed to identify risk areas with greater agility;
- Improvement of the process of raising demands between actors, based on the crossing of impacts and needs (added value);
- Assertiveness rate between planned (planning) and validated (execution) budgets with an average variation of 12.5%, as a result of the mapping actions and identification of critical interactions and their respective actions to mitigate systemic risks.

Regarding the uncertainties:

- Interdisciplinary collaboration based on the joint elaboration of scenarios reduced uncertainties and risks;
- The association between the Network Map and the Sankey Chart made it possible to evaluate the impact on secondary areas where decisions were previously made by impressions. An example of this gain was the indication of new projects for the area of nutrition, sterilization center and hospitality, in response to the expansion of units (service capacity – service provided);
- Maturation phases and interaction between deliverables streamlined decision-making, in response to the perception of systemic critical risks (network).

When observing the number of actions planned for the research, it was noted that all of them

were implemented, however, only a quantitative analysis proved to be superficial. This superficiality is related to restrictions regarding its scope, that is, the impossibility of applying these actions in all the projects that constituted the portfolio analyzed.

This incongruity was due to the fact that, although the selection of techniques and tools demonstrated convergence with the objective of the study, their characteristics did not make total sense when observing the characteristics of some projects already under development in the portfolio.

Only projects identified as complex and allocated in the demand and planning phases had all the actions listed in the plan carried out. However, in relation to the financial amount, the percentage corresponded to seventy-five percent of all allocated resources. This percentage included all critical projects (high added value and monetary investment). This reveals and reiterated the need to include qualitative aspects for the research, since only the quantitative bias would reduce the impact of the work developed.

Regarding the tools and techniques presented, the ClickUp® software, as well as the network diagrams, have become standard for exposure and evaluation in the weekly meetings with the board.

Limitations and suggestions for future work

The adoption of SSM as a methodology required the research to constantly review and expand the recommended data collection, since such action requires the identification concomitant with the execution of its execution stages (adaptive process). This represented an unestimated increase in time for the collection of the data necessary for the research and a redoubled effort so that the final objective of the research did not go out of focus.

As the study was limited to using complex thinking in the implementation of an institution's portfolio of projects in the area of philanthropic health, generalizations to other areas of health may represent bias, since the dynamics of influence for funding and influence of the actors involved for their projects can vary considerably. However, the choice for SSM demonstrated alignment with this

reality, since its learning cycle is contextual, that is, developed in a personalized way for each use.

That said, even with perceptible beneficial results, the following are pointed out as restrictions observed in the implementation of the defined action plan:

- The use of AHP in unison with the Sankey Diagram required a review of process improvement assumptions and the adoption of tools outside the scope of the research that contradicted some improvement strategies adopted (use of Lean);
- The cadenced follow-up of the stages of maturation of the projects by phases (deliverables) in association with the network maps (risks and systemic impacts) revealed operational gaps that minimized the expected gains for these tools and techniques. However, as predicted by the cycle of influences in Figure 4, the conclusion of this research was an opportunity to include specific training in the institution's leadership development programs for the coming cycle;
- Another limiting aspect was related to time, because, even though this work lasted for a period of almost a year, the adaptation of the language and techniques typical of complex thinking required dedicated time that was only possible due to the commitment of management to its implementation. This barrier can be easily referenced by Senge (2017) and Ackoff (1999), who mention the need for periods of awareness regarding the impact of this adoption on the organizational culture so that some tools can be minimally understood.

For future works, the inclusion of other actors in the construction of the research plan is indicated, since their involvement is crucial to pacify concepts and minimize risks related to the noise of understanding this current of thought, which advocates the breaking of paradigms typical of mechanistic thinking.

Final Thoughts

The adoption of complex thinking represented a paradigmatic change in the researcher's professional journey, as a view based on the incorporation of factors previously understood as avoidable as a rule for the development of actions required openness to knowledge previously ignored. However, this adoption has expanded the capacity to deal with these aspects and facilitated the identification of qualitative impacts where previously there was a translation of reality based only on a quantitative bias.

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