Improper Program Management-Induced System Archetypes

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ABSTRACT

Projects and programs: those two concepts are not one same side of a coin or even two different sides of a same coin. Despite the growing consensus among the project management community around the differences between the two topics, many organizations still fail to adopt a governance framework that considers such differences. The consequence is a domino effect: programs are treated as large projects, short-term focus values only the delivery of capabilities by component projects, an unhealthy internal competition between said projects is established, the organization's resources are burdened, and ultimately, organizations fail to realize benefits to their full potential. In this paper, we show that such situation fits into two well-known system archetypes, namely "Success to the Successful" and "Tragedy of the Commons". As case-study, we present a large, multi-year, multi-million Brazilian Government initiative, as well as the results achieved by said initiative, before and after a proper governance framework was in place. We also use System Dynamics (SD) to simulate and demonstrate said results, but also to forecast the expected results for the years yet to come, now that the programs and projects are given the proper treatment.

Keywords: System Dynamics; Project Management; Program Management; Benefits Management; System Archetypes; Governance.

Area: Gestão de Projetos de Desenvolvimento de Produtos e Serviços

1. INTRODUCTION

Would programs be only large projects or do they represent something **unique**? This question was made by Artto (2009) in a paper that discusses the foundations of program management. Pellegrinelli (2007) believes that programs are phenomena qualitatively different from projects and that organizations that see programs as large projects are using the right remedy to the wrong problem, losing most of the benefits that they could realize.

Yu and Kittler (2012), argue that programs need to establish an organizational structure as a strategic decision for the coordination of numerous organizations and activities involved. According to the PMI (2013), an effective governance structure supports the success of a program by constantly aligning the strategic vision, operational capabilities and resources committed by the sponsoring organizations.

Considering, as pointed out by literature, that there exist fundamental differences between projects and programs, if program managers are to be using solely project management tools and techniques in order to conduct programs, we can imagine that most of these initiatives will not meet the expected benefits, since, to PMI (2013) and TCO (2011), the central focus for programs to be considered successful is related to benefits management. Even further, without a thorough comprehension of the main focus of program management, mistakes can be made without the organizations not even noticing the origins of these problems.

Senge (1990) states that from the perspective of systemic thinking, some patterns and structures are recurrent within the organizations. Said researcher calls these patterns as "system archetypes", showing that not all management problems are specific to a particular organization. As observed by Braun (2002), the tools of SD are the basis for the identification of system archetypes, whose understanding contributes to the solution of knowledge fraction problem. In this perspective, it would be plausible to suppose that the lack of program management knowledge could generate **system archetypes** in the organizational decision-making structure that conducts projects and programs, thus generating in these initiatives structural errors or leading them to failure.

In this problem context, the use of program management will be analyzed as an alternative to project management through the following research question: how system archetypes can be used by organizations to understand the losses coming from the lack of use of program management practices? As such, the goal of this paper is to identify and describe how SD, through system archetypes, can be used to demonstrate the importance of benefits management, leading organizations to choose which practices are more suitable for them to conduct their initiatives.

In order to fulfill this goal, it will be presented in section 2, the evolution of the concepts regarding programs and program management, the importance of benefit management, concepts of governance applied to programs, the concepts related to SD and the system archetypes; in section 3, research method related questions; in section 4, the analysis of results; and, finally, in section 5, the conclusions of this work.

2. THEORETICAL BACKGROUND

2.1. System Dynamics

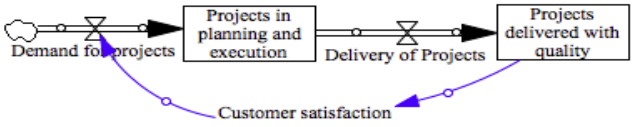
SD was introduced by Forrester as a method for modeling and analysis of the behavior of complex industrial systems. The modeling of systems can be classified in two types: **soft**,

more subjective and focused on the qualitative aspect and in the systemic learning; and **hard**, with a quantitative focus and aimed at simulation and decision-making (FORRESTER, 2009).

Soft modeling can be represented through causal loop diagrams (STERMAN, 2000). To Forrester (2009), the causal loop diagrams have two important goals, the first being to serve as a draft of the causal hypothesis while the second being to simplify the design of the model to be built for the simulation. The hard modeling, on the other hand, can be represented through the stock and flow diagrams, and because it demands greater detailing of the system's functional behavior, it allows mathematical approaches to be developed focusing on computational simulations (STERMAN, 2000).

Figure 1 presents a feedback cycle in which an organization that develops projects wishes to measure the effects generated by demand increase. The stock represented by variable "Number of Projects in Planning and Execution", accumulates the flow of projects originated in the flow "Demand for Projects". As the first stock increases, the other variables related to the number of people that develop these projects stay steady, and the flow "Project Delivery" begins to diminish. With delays and possible rework, the stock "Number of Projects delivered with Quality" begins to diminish, directly impacting customer satisfaction. As customer satisfaction decreases, the flow "Demand for Projects" begins to slow down (balancing loop), thus resulting in incoming losses and damage to the organizational image.

Figure 1. Flow and stock diagram. Source: Sales, Roses and Prado (2013)



2.2. Program governance and benefits management

Rijke (2014) justifies that the separation between projects and programs must occur because the relationship of the program to its projects is completely different from the relationship of the project to its deliveries and work packages. Thiry (2010), states that there exist four main elements intrinsic to programs that are enough for maintaining their sustainability, maturity and excellence: the management of decisions, the management of benefits, the management of stakeholders and the program governance. Between these, he opines that the management of benefits is the most important.

Breese (2015) states the there is evidence that a focus on benefits management improves the success rate of projects and programs, thus helping one to achieve organizational goals. However, Serra and Kunk (2015) suggest that benefits management should be integrated to governance processes to help organization to increase their ability to manage their success criteria.

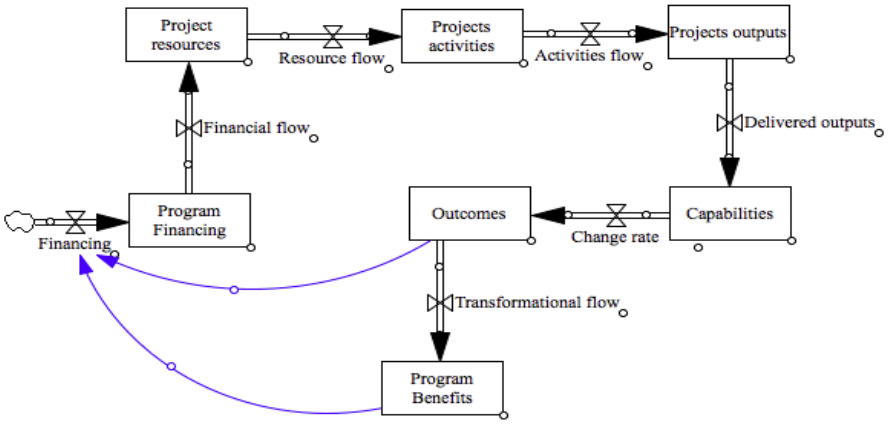
In TCO (2011), the logic behind the concepts of **benefits** can be found as the outputs of the projects build a new capability. This new capability will enable the outcomes (results), as long as a new operational state is achieved after the transition of the new capabilities to the operational environment. The results realize the planned benefits, and those contribute to one or more corporate objectives.

Beside this, the outputs of the projects are delivered by the projects activities, which, in turn, need to be financed with the resources of the Program. To PMI (2013), an important role of program governance is to ensure that programs are funded and support the resource requirements from the projects, since the majority of program costs is used by the projects and

not by the program itself. However, since programs are, usually, long-lasting efforts, their funding is linked to a policy of evaluating the outcomes and benefits delivered stage-to-stage.

This logical sequence of program management can be modeled by a flow and stock diagram, aiming to provide a better understanding for decision-making by a governance board, focusing in the benefits management, as presented in Figure 2. The model, inspired by the Ford and Sterman (1998) to projects activities, has two features: circular iteration and dynamic concurrence.

Figure 2. Flow and stock model to Programs. Source: The authors



In this model, a governance board makes decisions focusing on the benefits that the program must create, also taking into consideration the financial flow required to the support of the needs coming from the program's component projects. The activities flow out of projects, thus generating the outputs necessary to develop the new capabilities. These capabilities, after releases to an operational state, become the program's outcomes. These outcomes will become benefits as the program progresses. The cycle is closed because, stage-by-stage, outcomes and benefits being delivered control the new funding flow.

2.3. System Archetypes

According to Spicar (2014), system archetypes are general patterns found in diverse fields of knowledge, the causal loop diagram being used for their identification. One archetype example, the "Success to the Successful", according to Senge (1990), occurs when two activities compete for support or resources. The more successful one of them becomes, the more it secures support, thus weakening the other.

As shown in Figure 3, the aforementioned archetype is composed by two reinforcing processes, with the top cycle representing the success of initiative A, due to it receiving a little more of resources, considering that A reached a more rapid initial result. With the initial penalty suffered by activity B, the reinforcing cycle creates a negative spiral that cripples the possibility of development for this activity.

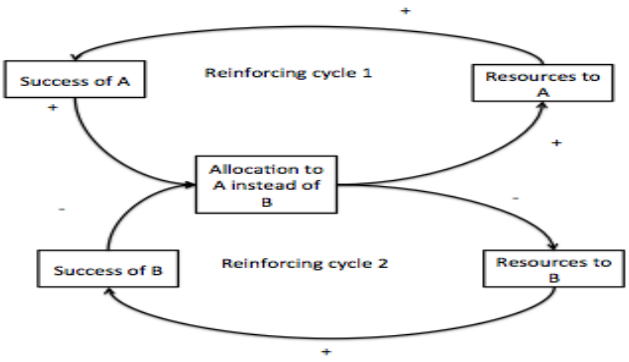
Following, in Table 1, it is presented a summary with the main characteristics of the two archetypes cited by Senge (1990) and that will be covered within this work.

Table 1. Success to the Successful and Tragedy of the Commons System Archetypes. Source: Senge (1996)

Archetype	Main Characteristics
Success to the	Two activities compete for support or limited resources. The more successful one of them becomes, the more support it earns, thus starving the

successful	other.
Tragedy of the commons	Individuals use a commonly available, though limited resource, exclusively based on their individual needs. Initially they are rewarded by using it; they end up obtaining ever diminishing returns, which leads them towards intensifying their efforts. In the end, the resource suffers significant reduction, erosion or is fully depleted.

Figure 3. Success to the successful archetype. Source: Senge (1996)



3. METHODOLOGY

In this study, under a descriptive-exploratory purpose, it was used the modeling process based in the proposal of Sterman (2000). The analysis unit is process of planning and executing the Connected Amazon Program (CAP). As such, the research object is the CAP itself, which is an initiative from the Brazilian Government, focusing on the implementation of a telecommunications infrastructure at Amazon, through 05 (five) information highways that use underwater optical fiber cables linking 52 cities in the Brazilian State of Amazonas.

The main benefit to be delivered by the program will be an effective improvement in the life conditions to the population living at Brazilian Amazon. In the first 12 months of the program (2014), it was decided that all resources would be invested in a pilot subproject of the Information Highway Project, connecting two cities. This decision was made because of the political visibility of the new capabilities, which would facilitate future investments.

All data used in this research were conceded to the researchers by CAP, through public documents available on its website. As such, from the selected documents onwards, a quantitative modeling was built based on the proposal of Sterman (2000), in 5 (five) steps summarized in Table 2:

Table 2. Methodological aspects. Source: The authors

Research Characterization	Organization of the Research
Methodological approach: Mixed	Empirical object: CAP
Type of research: Descriptive-exploratory	Observation amount: single case study
Investigation technique: Case study	Unit of analysis: planning and execution process from CAP
Data sources: Document analysis and acting participation	Unit of observation: Path to the benefits realization "Improvement in life conditions of Amazon's population"
Data analysis: through the modeling proposed by	Observation focus: to understand the role of benefits

Research Characterization	Organization of the Research
Sterman (2000) and construction of explanation	management in value delivery through of a program

4. ANALYSIS OF RESULTS

Following the proposal from Sterman (2000), in the first step of the research, it was attempted to clearly define the problem being focused by the to be developed modeling: CAP would deliver value to the population over the course of the next 48 months of activities, in case the evaluation of its progress would be related to the capabilities delivered by its projects? Besides this, still in the first step, it is necessary to identify the key variables of the problem. In Table 3, below, important variables were identified by the program's team.

Table 3. Variables for modelling. Source: The authors

Variables	Observations
Program Financing	The financial provisions are of about R$ 18 Million, as from 2015.
Rate of resource distribution to the projects	The financial resources were provided initially (2014), only to the Information Highways Project, due the perception that this Project was the great propeller to resource acquisition. As such, it was create a self-fulfilling prophecy: said Project received resources because it was efficient in the delivery of capabilities and was also efficient in the delivery of capabilities, as it pretty much received all available resources.
Rate of information highways implantation (Capability of Information Highways Project)	First 12 months (2014): 2 cities. Next 12 months (2015): 3 cities.
Rate of implantation of metropolitan networks (Capability of Public Policies Project)	First 12 months (2014): there was no implantation of metropolitan networks Next 12 months (2015): started implantation in 1 location

The CAP, among the many benefits it intends to deliver, has as main strategic orientation, to improve the life conditions of Amazon's population. This key benefit, as can be understood through the program's map of benefits, will only succeed, if and only if, IT services (with good quality levels) are effectively delivered to the interior of Amazon, which in turn represents a concrete and tangible improvement to the local population's life conditions.

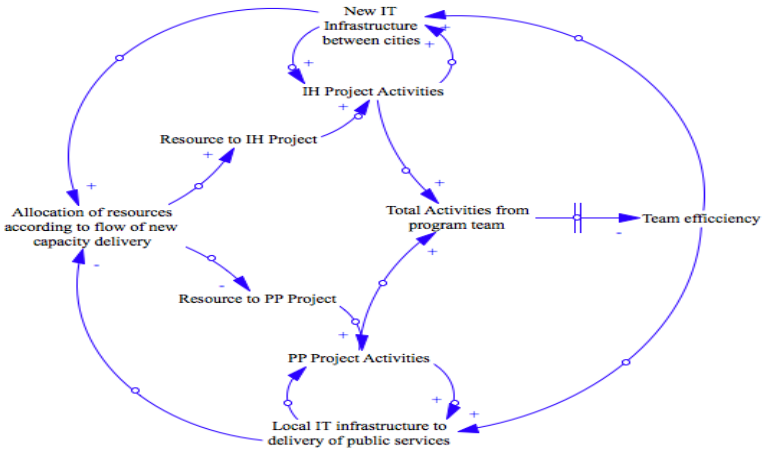
The second step of the modeling is the development of hypothesis through the construction of causal loop (qualitative) and flow and stock (quantitative) diagrams. Two projects were chosen: the Information Highways and Public Policies projects. This choice is directly linked to the existence of data for analysis, as they are the projects that contribute for reaching the focus benefit of the observation unit.

According to documents available in the Program's website, Information Highways Project is moving forward more rapidly than Public Policies Project. One of the reasons for this difference in speed is related to the visibility of the first Project, which makes it more capable for obtaining financing. It is also related to the natural challenge faced by the second Project, as the cities have their own dynamics and interests. However, when the governance board realized the problem (early 2016), it did not try to understand the causes of the difficulties in delivering the benefits. As such, believing that the Information Highway project's team was more efficient, the board decided to join the project teams, generating an unified pool of resources, to be used by both project managers. The result was even more disagreeable, as will be shown next. The dynamics described were mapped in the diagram of Figure 4.

The diagram presented in Figure 4 shows two archetypes: the Success to the Successful and Tragedy of the commons. The first archetype arises from the interaction resulting from the resource distribution mechanism based on the comparison of capabilities. Therefore, was defined by the governance board of the program that the funding depends almost entirely on the comparison of new delivered capabilities by the projects. The faster a project delivers a new capability, the faster it will have access to new financial resources. The second archetype arises from the interaction resulting from the allocation process of project teams as a centralized resource pool available to project managers.

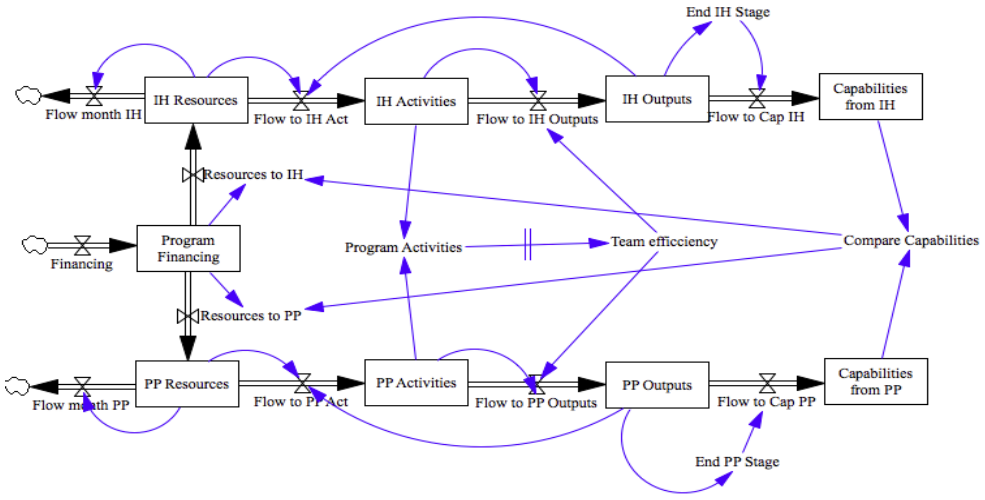
To Braun (2002), the first archetype suggests that success or failure can occur more due to initial conditions than the intrinsic merits of the initiatives. As CAP's funding source is the same for all projects (public resources), if the funding flow depends only on the comparison of new capabilities delivered by the projects, financial advantage is granted to the project that has an initial more rapid delivery. The next step was to model the flow and stock diagram for the understanding of the future consequences of current decisions, as presented in Figure 5.

Figure 4. Interaction between capabilities of Information Highways and Public Policies



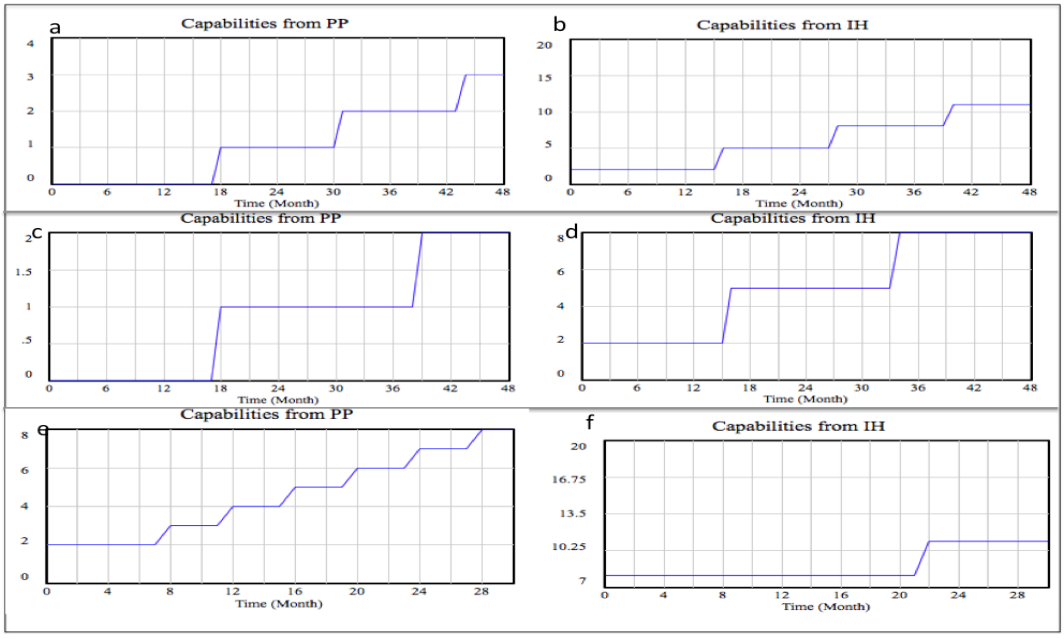
The third step is the formulation of the simulation model, with the inclusion of real world variables in the model developed in the previous step. The fourth step is the conducting of tests in the built model, aiming to verify if the conceptual model gets close to the real world. In charts "a" and "b" from Figure 6, a first scenario is presented, where it is possible to verify the potential for capabilities that will be delivered by the program in 48 months (2015-2018). The first 12 months were simulated with historical data, thus presenting results compatible to the current reality of the program: approximately 5 cities (or new locations) were served in early 2016 by IH Project and 1 city was with its network under construction.

Figure 5. Flow and Stock diagram - capabilities of Information Highways Project and Public Policies Project. Source: The authors



Thus, only in the middle of 2016 was the program able to deliver its first concrete benefit. If this trend was to continue, in early 2019 we would have 11 delivered capabilities (and 3 in progress) of the IH Project and 3 capabilities (and 1 in progress) of the PP project. This reality could be translated into 3 cities receiving the full-expected benefits. However, believing that the poor performance of the PP project was the result of its team, the governance board decided to create a centralized team to be used by the managers of the two projects, and this new scenario can be seen in charts "c" and "d" from Figure 6. The consequence was that the performance of both projects worsened as a system archetype was formed.

Figure 7. Simulation conceptual models. Source: The authors.



The governance board expected that by early 2017 another 3 capabilities would be delivered from IH Project. This did not happen (as foreseen in the simulation). As a result of this research work and the under-performance results by the projects, in early 2017 the governance board changed the decision-making rule on financial flow, now starting to take into account the combined results of the delivered capabilities. This is supposed to be the

correct way for the delivery of benefits, according to the model presented in Figure 3. It is then expected that in the next 12 months, with focus on benefits and with separate project teams, the program will deliver its benefits more quickly.

Aiming to prospect improvements in decision making, and already focusing on step 5 of the model proposed by Sterman (2000), two small modifications to the simulation model were done, with the financial flow no longer being controlled based on delivery of capabilities, but by the joint delivery of results by both projects under analysis, in other words, focusing on long term benefits. In this way, the variable "Comparison between capabilities delivered" will control the results delivered jointly by the projects, focusing on the benefits, changing the distribution of resources to the projects, focusing on the overall result (focus of benefits management). There was also no sharing of team resources between projects. Forecasting the next 28 months (charts "e" and "f" from Figure 6), we can see that there is a better balance between the delivered capacities of both projects, with 12 connected cities and 8 cities with networks, much higher than previous scenarios. In fact there will be an improvement in the perception of the delivery of the benefits due to a change in the decision-making process.

As such, through the use of the model presented, the concept of the management of benefits and their control performed dynamically, from the delivery of capabilities by the projects onwards, allows for its better assimilation by strategic decision makers, thus representing a more balanced focus on the choices related to the program's component projects.

5. CONCLUSION

We aimed to describe how System Dynamics, through system archetypes, demonstrate the importance of benefits management and program governance, applied inside a proper program management context, thus leading organizations to better conduct their strategic initiatives. Literature showed **consistent differences** between project and program management. Such differences can lure even the best managers, towards taking wrongful decisions, impairing the execution of the initiatives being carried out by organizations, and resulting in the lack of value, or benefits.

To avoid falling in such pitfalls, the recommendation proposed through the results of this study is that one must incorporate program management practices, in particular, the **focus on benefits** management, so that the archetypes can be avoided in organizational initiatives. The decision structure of programs or their governance structure needs to focus on benefits, even if said benefits only represent future, long-term outcomes.

Our conclusion is that the incorporation of program management practices, through the model presented in this research paper (Figure 2) can improve decision making in the strategic initiatives, thus preventing the occurrence of the harmful situation where delivered capabilities by individual projects will never become benefits for the organizations involved.

The main limitation of our work regards to the fact that this research is restricted to a single case study, thus not allowing one to generalize any of its results. As future works we propose: the identification of new archetypes, typical in a program management context, yet unidentified in the literature; the use of simulation models to prevent major public undertakings of failing to deliver the intended benefits to the population; incorporation into the proposed model of other typical of program management; and finally, the identification of SD tools that can be integrated into program management practices.

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