Understanding the Factors That Influence the Adoption of BPM in Two Brazilian Public Organizations

Carina Alves[1], George Valença[2], and André Felipe Santana[1]

[1]Centro de Informática, Universidade Federal de Pernambuco, Brazil
[2]Departamento de Estatística e Informática, Universidade Federal Rural de Pernambuco, Brazil
{cfa,afls2}@cin.ufpe.br, georgevalenca@deinfo.ufrpe.br

Abstract. While the increasing interest in BPM by private and public organizations confirm the relevance of process-centric philosophy, it also increases the expectations and uncertainties on how to introduce and evolve a BPM initiative. This paper investigates how BPM practices are adopted by Brazilian public organizations. We conducted case studies with two Brazilian public organizations to investigate how the interaction of barriers and facilitators influence the evolution of their BPM initiatives. A System Dynamics approach is proposed as a diagnosis tool to analyze the current performance of BPM initiatives. Systemic archetypes were created to represent specific combinations of virtuous reinforcement and balancing cycles among barriers and facilitators. We identified that support from top management and lack of team skills and competencies in BPM are key factors influencing the evolution of BPM initiatives. The implications for practice lies in the fact that systemic archetypes are generic structures repeatable in different contexts. Due to their predictable behavior, the recognition of archetypes can inspire effective action strategies to handle problematic situations that may occur in BPM initiatives facing similar situations.

Keywords: Business Process Management, Public Sector, Barriers and facilitators, System Dynamics Analysis.

1 Introduction

Business Process Management (BPM) has emerged as a holistic management approach. While the increasing interest in BPM by private and public organizations confirms the significance of process-centric approach [2], it also increases the expectations and uncertainties of how to initiate and evolve a BPM initiative. BPM is often associated with new technologies aimed at modeling and automating business processes. However, recent research suggests that the adoption of BPM philosophy involves complex cultural and organizational changes [6]. In recent years, we have observed an increasing adoption of BPM by Brazilian public sector. Two main reasons motivate public organizations to pursue a process-centric perspective. The first reason relates to the demand from citizens to increase the quality of public services. The second reason is the need to adopt digital technologies to create new service delivery channels. Brazilian public organizations face continuous pressure for

accountability and transparency of their activities. Successful examples of e-government initiatives are online submission of tax returns and electronic voting. Besides serving the public interest, governmental organizations have other distinctive characteristics compared to private organizations, such as: machinery of government changes, low flexibility and innovation, stiffness of a hierarchical structure and influence of political factors. A number of studies have highlighted the growing interest of BPM by the public sector [1,2,3]. However, low attention has been paid to the evolution and overall success of BPM initiatives. Motivated by the previous scenario, this research investigates how BPM practices are adopted by Brazilian public organizations. In particular, we aim to explore the following research questions:

RQ1: What are the facilitators and barriers faced by BPM initiatives in Brazilian public organizations?

RQ2: How the interaction of facilitators and barriers influence the evolution of BPM initiatives in Brazilian public organizations?

In this paper, we report on results from two case studies conducted with Brazilian public organizations. To explore the barriers and facilitators faced by studied organizations, we designed and performed a System Dynamics Analysis approach based on the Systems Thinking discipline proposed by Senge [4]. This approach treats barriers and facilitators as factors that can interact with each other to create patterns of dysfunctional systemic behaviors, which may slowdown the success of BPM initiatives. This paper is structured as follows: Section 2 presents the research background. Section 3 describes the research method. Section 4 describes research results. Section 5 presents a discussion of findings and limitations of this study. Finally, Section 6 concludes the paper and provides directions for future research.

2   Background

2.1   Maturity of BPM Initiatives

The introduction of BPM in organizational environment aims to promote increased agility, efficiency and innovation in operation [1]. However, organizations still struggle to realize a comprehensive adoption of BPM [10]. This challenge is mainly due to the fact that BPM initiatives are affected by contextual characteristics of each organization. Therefore, the effective adoption of BPM approaches needs to be carefully instantiated to the specific needs and characteristics of each organization. Rosemann and Bruin [5] propose a comprehensive BPM maturity model. These factors were further refined by Rosemann and vom Brocke [7] to build a framework for BPM. The model describes six core factors to BPM success, which are:

- Strategic alignment – BPM initiatives must be aligned with strategic goals of the organization through a bidirectional link. Business process improvement efforts have to be defined according to strategic priorities.

- Governance – provides a reference framework to guide organizational units to ensure responsibility and accountability. BPM governance can be considered the lead of the BPM initiative.
- Methods – a set of methodologies, techniques and tools supporting the different phases of process lifecycle. BPM CBOK, Balanced Scorecard and Six Sigma are examples of such approaches.
- Information Technology – refers to hardware, software and IT solutions that support modeling, automation and improvement of business processes. Several solutions are available from workflow-based systems and process mining tools to complement BPM suites.
- People – consists on stakeholders of the organization. Education and communication of BPM principles are key strategies to disseminate a process-driven culture.
- Culture – is perceived as a key driver for the success or failure of BPM [6]. Cultural values supporting the BPM initiative include customer orientation, readiness for change, understanding of process concepts, tendency for collaboration and influential leadership.

Our research aims to investigate current strengths and weaknesses influencing BPM evolution. With this goal in mind, we adopted the former six factors to investigate how the related barriers and facilitators interact with each other and affect the performance of the BPM initiative.

2.2   System Dynamics

According to Sterman [8], System Dynamics discipline helps people to (i) learn about the structure and dynamics of the complex systems in which we are embedded, (ii) design high-leverage policies for sustained improvement, and (iii) catalyze successful implementation and change. Systems archetypes are known patterns of system behavior representing specific combination of virtuous reinforcement and balancing cycles formed by its component variables [10]. They describe or predict the behavior of a system by drawing related causal loops of variables from this scenario. There are 13 generic archetypes, according to Senge [4]. Each archetype has a script that guides the interpretation of the investigated context. The selection of an archetype depends on how the related script appropriately describes the phenomena identified. This is accomplished by recognizing variables in the context holding cause and effect relations that fit the archetype script. The use of system archetypes is a rich technique for either examining a past situation or forecasting specific scenarios by identifying potential traps and mitigating risks of occurrence. It is worth noting that the effectiveness of System Dynamics approach depends on the capacity of the actors involved to reflect on their reality. They should go beyond gathering superficial factors that translate the functioning of the studied context.

3   Research Method

This study is part of a larger research project [1, 3] that aims at (i) identifying the most relevant factors influencing the evolution of BPM and (ii) proposing strategies

to increase the maturity of BPM initiatives in Brazilian public organizations. The cases were purposively selected based on expectations about their information content. Moreover, since we had access to organizations A and B, we could follow their initiatives for a prolonged time (i.e. a period of three years). In this paper, we present two case studies conducted with Brazilian public organizations. We developed a single research protocol describing data collection and analysis procedures [9]. The case studies were structured in three phases, which are following described.

Phase 1 – Semi-Structure Interviews and Focus Groups
In this phase, we conducted semi-structured interviews with two BPM leaders in each organization. The interviews consisted of two parts: (i) general questions regarding demographic and contextual aspects of the organization; and (ii) specific questions addressing goals, barriers and facilitators of their initiatives. In particular, the elicitation of barriers and facilitators was inspired by the six core elements critical to BPM success presented in Section 2.1. We conducted several in-depth interviews with two leaders from organization A and one leader from organization B during one year. All interviews were registered using a voice recorder and later transcribed to spreadsheets. We also organized two focus groups with four BPM leaders from public organizations participating in the research project, where leaders from both studied organizations have participated. The goal of these focus groups was to discuss common practices, lessons learned and challenges faced by organizations.

Phase 2 – System Dynamics Analysis
A System Dynamics Analysis was performed at this phase. During meetings with BPM leaders, we obtained an exhaustive set of barriers and facilitators. These factors were prioritized according to their impact on the initiative, and subsequently selected based on the following division: 2/3 of barriers and 1/3 of facilitators. We adopted this approach to emphasize the barriers, which are the negative aspects that must be mitigated. To avoid a complex matrix with a heavy number of crossings, we attempted not to exceed a total of 15 factors. The final set was neutralized (removal of verbs and adjectives) to derive variables and simplify the analysis of causal relations, avoiding inappropriate logical comparisons. For example, the barrier *lack of BPM roles and responsibilities* was modified to *BPM roles and responsibilities*. This set of variables was represented in lines and columns of a causal matrix. Each variable in a line was analyzed to identify its potential influence on other variables listed in the columns. Relations were determined by crossing lines with columns and received a code "d" or "i". It indicates that the variable in the line affects the variable in the column in a directly ("d") or inversely ("i") proportional form. The values '3' and '1' were then assigned to these codes, representing standard weights related to the intensity of causal relations, where '3' represents a high intensity and '1' means a low intensity. Cells in the matrix with no code state that no relation was identified between two variables.

Based on the results from the interviews, we constructed causal matrixes for both organizations. Individual discussion meetings were held with BPM leaders where we

explained the complete matrixes as a starting point for discussion. Then, they were asked to indicate whether the relations and weights of the factors were appropriate. After this procedure, the variables in the resultant matrix were reordered by values in the columns 'Sum weight of causes' and 'Sum weight of effects' (Figure 1). These sums inform variables' systemic power. They are useful to identify potential leverage factors to the performance of the investigated BPM initiatives. Finally, causal relations were examined to identify systems archetypes. The archetypes represent the performance of BPM initiatives concerning barriers and facilitators. While constructing such archetypes, we included specific factors that contribute to the dynamics observed. In some cases, when interviewees did not explicitly mention the factors, we were able to infer the factors due to our familiarity with both initiatives.

#	VARIABLES	Team motivation	Support from top management	Speed of team learning	Financial resources	Compliance with the payment schedule	Vertical structure culture	Roles and responsibilities definition	Concurrence with non-BPM activities	BPM maturity	Proper operation of the BAM tool	Availability of adequate IT infrastructure	Process owner abilities	Priority to implement systems integration	BPM team turnover	Delay in implementation of modeled processes	Total of CAUSES	SUM of Weights for being CAUSE	SUM of Weights for being EFFECT
1	Team motivation			p3	p3			p1		p3			p1		i1		6	12	25
2	Support from top management	p3		p1	p3	p3	i1	p3	i3	p3	p1	p3	p3	p3	i1		13	31	8
3	Speed of team learning	p3	p1				i1	p1		p3	p3		p3		i1	i1	9	17	15
4	Financial resources	p3	p1			p3	i1	p1	p1		p1	p3			i1	i1	10	16	4
5	Compliance with the payment schedule	p1								p1				i3	i1		4	6	8
6	Vertical structure culture					i1				i3			i3				3	7	13
7	Roles and responsibilities definition	p1		p1					i1	p3			p3		i1		6	10	14
8	Concurrence with non-BPM activities	i3		i3		i1		i1		i3	i1	i1	i3	i1	p1	p1	11	19	8
9	BPM maturity	p3	p1	p3	p1		i3	p3	i1		p1	p1	p3		i1	i3	12	24	31
10	Proper operation of the BAM tool	p1	p1				i1			p1			p1				5	5	12
11	Availability of adequate IT infrastructure	p1		p3						p1	p3						4	8	8
12	Process owner abilities	p1					i3	p3		p3	p1				i1		6	12	21
13	Priority to implement systems integration	p1							i1	p1							3	3	14
14	BPM team turnover	i1		i1						p1	i3	i1		i1		p1	7	9	8
15	Delay in implementation of modeled processes	i3	i1					p3	i1			i3					5	11	11

Fig. 1. Causal Relations Matrix for Organization A

Phase 3 – Validation Meetings

A final validation meeting was undertaken with BPM leaders from both organizations to present the archetypes created. The main goals of this phase were (i) discussing our findings to identify necessary adjustments in the archetypes and obtain concluding remarks and, particularly, to carefully validate our personal inferences; and (ii) providing leaders of organizations with a rich diagnosis of BPM initiatives, highlighting its utility as a learning tool to direct suitable actions towards initiative's evolution.

4   Results

4.1   Context

Organization A is responsible for the public administration of Recife, capital of Pernambuco State. The execution of business process modeling and improvement activities started in 2006 with the conduction of several pilot projects. In 2010, a formal BPM initiative was established. Since then, they have modeled and automated major business processes. However, processes are monitored in an ad-hoc fashion. This organization has not yet established a Business Process Management Office (BPMO). Leaders recognize that this limitation may threaten the evolution of their initiative.

Organization B is responsible for auditing the accounts of Pernambuco State and its municipalities. The definition of a BPM initiative started in the beginning of 2012, although informal process modeling efforts had been previously conducted. A BPMO has been established in 2013. Table 1 gives an overview on how each organization is handling the six core factors critical to BPM maturity, as presented in Section 2.1.

4.2   Case Study A

As a result of the interviews with BPM leaders from organization A, we elaborated a list of barriers and facilitators, in which an exhaustive group of 38 variables was obtained. After few interactions, we refined the initial list into a set of 15 prioritized variables, with 5 facilitators and 10 barriers. This list is represented in the causal matrix in Figure 1. The matrix presents barriers and facilitators (in red and blue, respectively) and establishes relations among them. The BPM team was responsible to indicate the existing relations and weights among the variables.

In order to identify potential leverage factors to the performance of the BPM initiative, variables in the matrix were reordered considering the values in the columns 'Sum weight of causes' and 'Sum weight of effects'. Table 2 presents the variables reordered by their systemic power. The next step consisted of analyzing the causal relations identified and frame them in a systemic archetype. The structure selected is known as *growth and underinvestment* archetype, which is presented in Figure 2. It intends to represent situations where the performance of a system evolves during a

certain time, and then it starts to halt due to a lack of investment in factors that could leverage its accomplishment.

Table 1. Contextual factors in Organizations A and B

Factor	Organization A	Organization B
Strategic Alignment	The initiative begun with the goal of monitoring KPIs. Then, it evolved to focus on the execution of process modeling and automation. The initiative successfully evolved over the years. However, it lacks an explicitly alignment with the corporate strategy.	The BPM initiative belongs to the organizational planning area, which ensures its alignment with strategic goals. According to the organization strategic planning (2012-2018), BPM initiative is formally a strategic action. The president and directors actively sponsor the initiative.
Governance	Governance is not a relevant concern. Therefore, no governance model was identified. The organization does not plan to adopt one in the short term.	Corporate governance is a main concern for the organization due to its role as public accounts auditor. The organization shall build a BPM governance model in next months.
Methods	No formal BPM methodology is adopted. However, the organization received extensive support from external consultants.	A BPM methodology is currently under construction by the internal team and external consultants.
IT	Intensive use of BPM systems, such as Bizagi and Agiles. However, the organization lacks an appropriate technical infrastructure (i.e. computers, network facilities, etc.).	Bizagi is adopted for process modeling. No BPMS is currently in use, but the organization has plans to acquire a BPM suite in the short term.
People	Stakeholders have not receive appropriate training on BPM concepts. In addition, the limited size of the BPM team restricts the evolution of the initiative.	Internal staff and external consultants conduct the BPM initiative. An intensive training program is in course to ensure that knowledge is satisfactorily transferred to the BPM team.
Culture	Strong hierarchical structure may challenge a BPM vision. BPM leaders aim to achieve individual goals without coordination with other areas, because there is a low integration among areas.	Hierarchical structure. The organization is attempting the build a project-driven culture. Corporative education and communication channels are well defined. Staff has a strong resistance to change.

Table 2. Variables in Organization A reordered by their systemic power. factors labeled with (*) should be preceded by "lack of", as reported by interviewees.

#	Variable	Facilitator or Barrier	Sum Weight of Causes	Sum Weight of Effects
1	Support from top management	F	31	8
2	BPM maturity (*)	B	24	31
3	Concurrence with non-BPM activities	B	19	8
4	Speed of team learning	F	17	15
5	Financial resources	F	16	4
6	Team motivation	F	12	25
7	Process owner abilities (*)	B	12	21
8	Delay in implementation of modeled processes	B	11	11
9	Roles and responsibilities definition (*)	B	10	14
10	BPM team turnover	B	9	8
11	Availability of adequate IT infrastructure (*)	B	8	8
12	Vertical structure culture	B	7	13
13	Compliance with the payment schedule	F	6	8
14	Proper operation of BAM tool (*)	B	5	12
15	Priority to implement systems integration (*)	B	3	4

The archetype in Figure 2 encompasses three main loops, detailed as follows.

R – This is a ***virtuous reinforcement loop*** representing a dynamic structure that led the BPM initiative to perform effectively. The central variable *Results of the BPM initiative* was inferred by us considering our deep understanding of the studied organization. It indicates the efforts carried out to promote BPM and the positive results already obtained by the initiative. This variable reinforces the initiative evolution and consequently fosters the *Support from top management*. An increased sponsorship contributes to the availability of *Financial resources*, which leads to *Compliance with the payment schedule* for external consultants. In the long term this reinforces the *Results of the BPM initiative*, which strengthens *Team motivation*. A more active BPM team promotes the *Support from top management* and equally contributes to augment the *Speed of team learning*, which in turn reinforces *Team motivation*.

B1 – This **balancing loop** is mainly formed by variables that were pointed out as barriers, and whose interactions tend to slow down and break the performance of the virtuous reinforcement loops in **R**. This occurs when *Results of the BPM initiative* generates *Concurrence with non-BPM activities*. It means that people involved in the initiative started to accumulate new responsibilities besides the BPM activities. As a consequence, it is possible to remark the absence of *Roles and responsibilities definition*. The later variable decreases the *BPM maturity* and strengthens the shortage of members with *Process owner abilities*. In turn, it reinforces a *Vertical structure culture,* which is also caused by the low level of *BPM maturity*. This highlights an organizational structure with areas not properly integrated and mainly pursuing its individual goals. The complete loop results in less *Results of the BPM initiative*.
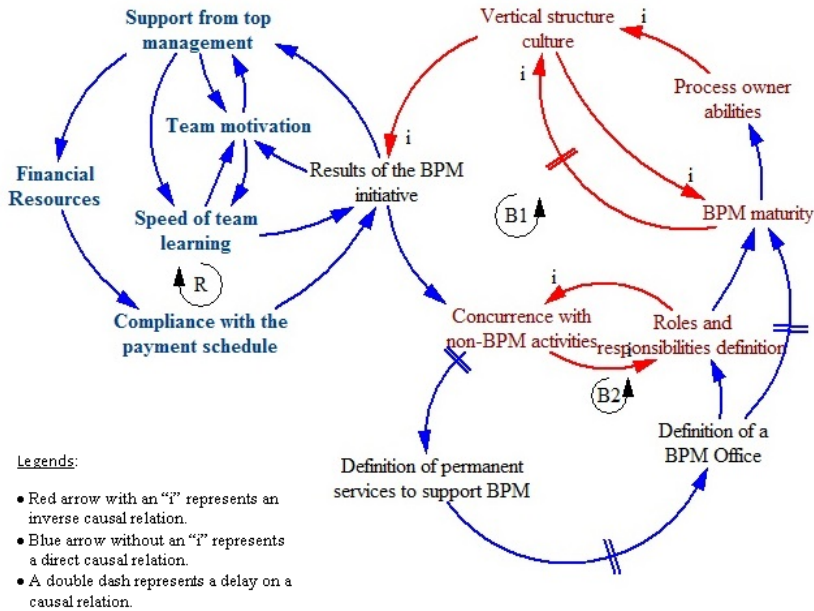
Fig. 2. Growth and underinvestment archetype for the BPM initiative in Organization A

B2 – This represents a ***corrective balancing loop*** to describe the underinvestment structure present in the BPM initiative. We can perceive that the *Concurrence with non-BPM activities* leads to the need of *Definition of permanent services to support BPM*. This promotes the relevance of the variable *Definition of a BPM Office*, considering that a specific organizational unit ideally should provide BPM services. The establishment of a BPM Office fosters the *Roles and responsibilities definition*. As a consequence, the organization achieves greater *BPM maturity*. Loop *B2* shall invert the slowdown effect of balancing loop in *B1* and consequently contributes to the sustenance of the initial performance growth.

In the second round of interviews conducted to follow the initiative evolution, we observed that Organization A had profound changes in the majority of managerial positions due to new elections. However, the BPM initiative did not have significant evolution. The BPM Office was still not fully established and the supporting infrastructure to process automation continued deficient. Hence, there was not a proper infrastructure support for new BPM projects. We conclude that the typical effect of growth and underinvestment archetype is strongly characterized in Organization A.

4.3   Case Study B

In Organization B, our initial analysis of barriers and facilitators generated a list of 21 variables. After prioritizing this list, 15 variables were obtained, from which 5 were facilitators and 10 were barriers. The causal matrix is presented in Figure 3.

#	VARIABLES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total of CAUSES	SUM of Weights for being CAUSE	SUM of Weights for being EFFECT
1	Support from top management		d3	d3	d1	d1	i1	i3	i3	d1			d3			d1	10	20	20
2	BPM pilot projects	d3					d3	i1	i3	d3	d1		i3		d1		8	18	32
3	Availability of an area responsible for disseminating BPM culture		d3		d3			i3	i3	d3		d3	d1	d1	d3		9	23	25
4	Clarity of the BPM initiative objectives	d3	d3	d1				i3	i1					d3	d1		7	15	7
5	Prerogative of organizational development by the unity responsible for the BPM initiative			d3									i1	d1			3	5	12
6	Concurrence with non-BPM activities		i3	i3				d1	d3	d1			i1				6	12	13
7	Discontinuity of BPM initiatives	i3	i3	i3							d1						4	10	31
8	Resistance to change	i3	i3	i1		i3				d3		i3			i3		8	20	22
9	Integration of organizational areas	d1	d3	d3		d1	i3	i3				d3			d1		8	18	23
10	Managers fearing power loss		i1	i1		i3	d3	d3	d3	i3							7	17	2
11	Focus on strategic goals	d1					i1	i1	i1	d3							5	7	11
12	Availability of resources		d3	d1		d1	i1							d1	d3	d3	7	13	11
13	Internal and external communication strategies of the BPM initiative	d3	d3	d3			i1	i3	i3	d3	i1						8	20	31
14	Team skills and competencies in BPM		d3	d3	d3	d3	i1	i3	i1			d1	d1	d3		d3	11	25	11
15	Availability of a BPMS	d3	d1					i3		d3		d1					5	11	8

Fig. 3. Causal Relations Matrix for Organization B

It was possible to classify the variables according to their systemic power by examining the columns 'Sum weight of causes' and 'Sum weight of effects' in the resulting causal matrix. Table 3 displays the reordered matrix, classifying the 15 analyzed factors. By analyzing relations in the causal matrix and concerns manifested by the BPM leaders, we identified the archetype structure *Growth and Underinvestment*, similarly to the case of Organization A. We discuss the causal relations and loops that compose the archetype shown in Figure 4.

R1 and **R2** – These two cycles compose a ***virtuous reinforcement loop*** where *Availability of an area responsible for disseminating BPM culture* enables *Clarity of the BPM initiative objectives*. Therefore, it is possible to establish *BPM pilot projects* as a central goal that triggers business process improvement efforts along the organization. A clear view of the initiative objectives also fosters the *Support from top management*. As a whole, these two later factors reinforce the *Availability of an area responsible for disseminating BPM culture*. These loops form a dynamic structure that initially leverages the performance of the BPM initiative in Organization B.

B1 – This represents a ***balancing loop*** that in the long term shall inhibit the positive influence of the virtuous cycles **R1** and **R2**. In this loop, by increasing the number of *BPM pilot projects* the organization reduces the *Availability of resources*, since the

Table 3. Variables in Organization B reordered by their systemic power. Factors labeled with (*) should be preceded by "lack of", as reported by interviewees.

#	Variable	Facilitator or Barrier	Sum Weight of Causes	Sum Weight of Effects
1	Team skills and competencies in BPM (*)	B	25	11
2	Availability of an area responsible for disseminating BPM culture	F	23	25
3	Support from top management	F	20	20
4	Internal and external communication strategies of the BPM initiative (*)	B	20	31
5	Resistance to change	B	20	22
6	BPM pilot projects	F	18	32
7	Integration of organizational areas (*)	B	18	23
8	Managers fearing power loss	B	17	2
9	Clarity of the BPM initiative objectives	F	15	7
10	Availability of resources (*)	B	13	11
11	Concurrence with non-BPM activities	F	12	13
12	Availability of a BPMS (*)	B	11	8
13	Discontinuity of BPM initiatives	B	10	31
14	Focus on strategic goals (*)	B	7	11
15	Prerogative of organizational development by the unity responsible for the BPM initiative	F	5	12

BPM team shall be allocated in several parallel projects. In the long term it contributes to the *Discontinuity of BPM initiatives* and hampers the conduction of *BPM pilot projects*, which is a central variable of the virtuous loops *R1* and *R2*. This is a paradoxical effect in the dynamics of this case: by increasing the number of *BPM pilot projects* in the short term, the initiative shall block these projects in long term, due to the low *Availability of resources*.

B2 – Similarly to **B1**, this represents a ***balancing loop*** that in the long term tends to inhibit the virtuous cycles *R1* and *R2*. Within this cycle, *BPM pilot projects* shall increase *Managers fearing power loss*. It means that managers may understand that these projects are affecting their own areas and threatening their control. This intensifies *Resistance to change*, contributing to *Discontinuity of BPM initiatives* and reducing the number of *BPM pilot projects* in the long term.

B3 – This is another ***balancing loop*** that tends to inhibit the virtuous cycles *R1* and *R2* in the long term. In this cycle, *BPM pilot projects* increase the *Concurrence with non-BPM activities*. It means that BPM activities initially do not have a high priority, as they will be undertaken in parallel with daily activities by technical and management staff. This intensifies *Resistance to change*, considering that participants of the pilot project may perceive process improvement efforts as fruitless activities or as
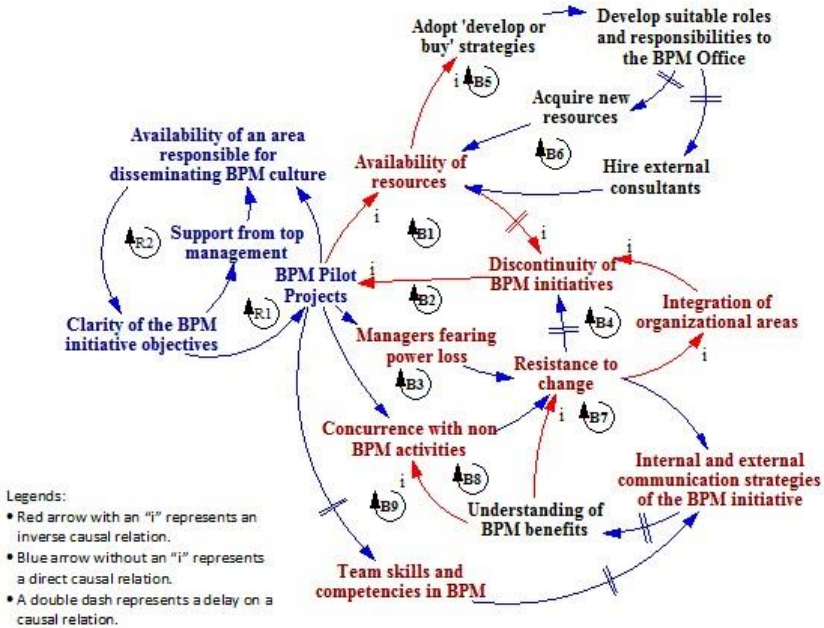
Fig. 4. Archetype **Growth and Underinvestment** for BPM initiative in Organization B

something that will bring extra work. As a consequence, the later variable contributes to the *Discontinuity of BPM initiatives*, which shall hamper the execution of new *BPM pilot projects* in the long term.

B4 – This **balancing loop** tends to negatively influence the virtuous cycles **R1** and **R2** in the long term. *BPM pilot projects* shall generate *Concurrence with non-BPM activities*, which will increase *Resistance to change*. As a result, there will be less *Integration of organizational areas*, promoting the *Discontinuity of BPM initiatives*. This cycle in the long term may reduce the number of *BPM pilot projects*.

B5 and **B6** – These two cycles act as balancing loops, but differently from **B1**-**B4**, they compose a wide **corrective balancing loop**. The low *Availability of resources* causes the organization to *Adopt 'develop or buy' strategies*. This may lead the organization to *Develop suitable roles and responsibilities* to the BPM Office to ensure a clear view of current needs for BPM. Therefore, the organization can either *Acquire new human resources* or *Hire external consultants*. These variables increase the *Availability of resources*. We must highlight that part of the corrective actions in the archetype are already in course in Organization B. They have recently hired external consultants to support the establishment of a BPM Office.

B7 and **B8** – These cycles are similar to **B5** and **B6** and compose a **corrective balancing loop**. To reduce the *Resistance to change* it is necessary to develop *Internal and external communication strategies* of the BPM initiative. These strategies shall disseminate information about the BPM key concepts, while communicating the results of the initiative. As a consequence, there should be an increased *Understanding of*

BPM benefits. This tends to reduce *Resistance to change* and *Concurrence with non-BPM activities*.

B9 – in the long term *BPM pilot projects* may help to develop *Team skills and competencies in BPM*, which also in the long term would support the development of *Internal and external communication strategies* of the BPM initiative. After a certain period, these strategies shall increase the *Understanding of BPM benefits* and consequently lead to less *Resistance to change*. Finally, this should reduce risk of *Discontinuity of BPM initiatives* and increase the number of *BPM pilot projects*. Hence, **B9** is a loop with long term effects.

The delay in perceiving the need to take corrective actions is a common trap in *growth and underinvestment* situations. Additionally, a contradictory characteristic of these contexts involves actions that in the short term serve to leverage a desired performance. These actions also tend to block this scenario if nothing is done to establish an appropriate infrastructure in the long term.

5   Discussion

System dynamics analysis enabled us to identify factors affecting the current situation of the studied organizations. We observed that in Organization A *Support from top management* was the main cause of several patterns detected in the initiative evolution. It means that the initiative is based on a robust support from the executive management, which empowers the BPM team to take strategic decisions and engage the whole organization to effectively adopt BPM. On the other hand, increasing *BPM maturity* was perceived as the direct result of the interaction among variables. In Organization B, not having a skilled BPM team was evidenced as the central cause of interaction among variables. The lack of *Team skills and competencies in BPM* in the long term may threaten the initiative evolution and even affect its discontinuity. On the other hand, *BPM pilot projects* appeared as the main consequence of the dynamics among several variables. Pilot projects are facilitated by an active sponsorship and existence of an area responsible for the initiative. Concerning the resultant archetypes, the following similarities were observed through the comparative analysis of the two organizations dynamics:

- The ***growth and underinvestment*** archetype is a valid systemic pattern for both initiatives. This occurs since both organizations did not properly invest in a supportive infrastructure for the initiatives, which may hamper BPM evolution. Establishing major BPM roles and responsibilities, and formalizing a BPMO are strategies to overcome this infrastructure deficiency and enable the initiative to thrive.
- Our analysis identified common variables for both cases. They play a similar role in the initiatives: *Support from top management* integrated the virtuous reinforcement cycle and enabled the growth of the initiatives. While *Concurrence with non-BPM activities* was part of the cycle that inhibits the success of the BPM initiative.

We also identified key differences between the dynamics observed in the initiatives:

- In Organization A the ***growth and underinvestment*** archetype represents the current reality of the BPM initiative. The archetype was considered as representative for the studied situation, since its typical effect of having the evolution threatened by a lack of investment in infrastructure is strongly characterized in this organization. The initiative experienced a growing period, but it currently presents signs of stagnation due to its deficient infrastructure. This became a serious limitation for the automation of new business processes, for instance.
- Organization B is slightly different because its initiative has recently started. Thereby, the archetype represents a forecasted scenario, and the organization increases its chances to act preventively against undesired predictions. It is important to mention that we obtained richer data from this organization, which enabled us to develop a more detailed archetype.

The interpretation of the archetypes suggests that organizations may perceive a tradeoff between expanding the BPM initiative due to its initial success and investing sufficient resources to guarantee its sustainable growth over time. In Organization A, it was evidenced that the poor infrastructure is mainly related to the absence of a formal BPMO. This situation may change if an office is established so that staff turnover is reduced. One appropriate decision here would be to stop the automation of new processes until this infrastructure is at least satisfactory. The analysis of BPM initiative dynamics in Organization B revealed that *Team skills and competencies in BPM* and *Internal and external communication strategy for BPM* are relevant leverage points. These are actual barriers with a heavy systemic impact, but they do not demand a challenging action. They represent factors that the organization should carefully treat to promote a corrective balancing cycle and foster the initiative evolution.

Comparing our results with the factors proposed Rosemann and vom Brocke [7], we observed that the common variable *Support from top management* is associated with the ***strategic alignment*** factor. The variable *Concurrence with non-BPM activities* represents an initial resistance to adopt BPM practices. This is related to the factors ***people*** and ***culture***, reinforcing the relevance of BPM education and communication to establish a process-oriented culture. The intention of both initiatives to establish major BPM roles and responsibilities, together with a formal BPMO indicates their concern with ***governance*** and ***methods*** factors. In both organizations, we did not observe an explicit relevance of ***IT*** factor.

6   Conclusion

This paper presents the use of systemic archetypes to explore the cause-effect interaction of barriers and facilitators in BPM initiatives of two Brazilian public organizations. We investigated patterns in the relations between barriers and facilitators to recognize archetypes representing systemic behaviors in the studied initiatives. Due to their predictable behavior, the recognition of archetypes can inspire effective action strategies to handle problematic situations that may occur in BPM initiatives facing similar situations. It is worth mentioning that the interpretation of a particular reality in terms of archetypes depends upon the following conditions: (i) researcher

experience in the general structure of known archetypes; (ii) identification in the studied reality of features and variables that fit a particular archetype structure; (iii) validation of the created archetypes with participants of the studied reality. We plan to perform new case studies to increase the understanding on how systemic archetypes can help BPM teams to reflect upon their own actions and conduct informed decisions during the evolution of BPM initiatives.

References

1. Valença, G., Alves, C., Santana, A.F., Oliveira, J., Monteiro, H.: Understanding the Adoption of BPM Governance in Brazilian Public Sector. In: Proceedings of 21st European Conference on Information Systems, Utrecht, Netherlands (2013)
2. Tregear, R., Jenkins, T.: Government Process Management: A review of key differences between the public and private sectors and their influence on the achievement of public sector process management. In: Proceedings of 1st Int'l Workshop on Management of Business Processes in Government, Brisbane, Australia (2007)
3. Santana, A.F.L., Alves, C.F., Santos, H.M., Felix, A.L.C.: BPM Governance: An Exploratory Study in Public Organizations. In: Proceedings of the 12th Int'l Conf.on Business Process Modeling, Development and Support, London, pp. 46–60 (2011)
4. Senge, P.M.: The Fifth Discipline: The Art & Practice of the Learning Organization. Crown Publishing Group, New York (2006)
5. Rosemann, M., Bruin, T.: Towards a Business Process Management Maturity Model. In: Proceedings of 13th European Conference on Information Systems, Regensburg, Germany, May 26-28 (2005)
6. Tumbas, S., Schmiedel, T., Bringmann, M.: vom Brocke, J.: Developing a BPM-Supportive Organizational Culture: on the Importance of Contextual Factors. In: Proceedings of 21st European Conference on Information Systems, Utrecht, June 6-8 (2013)
7. Rosemann, M., vom Brocke, J.: The Six Core Elements of Business Process Management. In: vom Brocke, J., Rosemann, M. (eds.) Handbook on Business Process Management, vol. 1, pp. 107–122. Springer, Heildelberg (2010)
8. Sterman, J.D.: Business Dynamics: Systems thinking and modeling for a complex world. McGraw-Hill (2000)
9. Yin, R.: Case Study Research: Design and Methods, 5th edn., vol. 4. Sage Publications (2009)
10. Wolstenholme, E.: Using generic system archetypes to support thinking and modelling. Syst. Dyn. Rev. 20, 341–356 (2004)