An Actor-Network Perspective on Business Process Management: A Case Study of a Brazilian Chemical Company

Completed Research Paper

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Abstract

This paper aims to discuss and highlight the sociotechnical complexity of Business Process Management (BPM) projects. In the pursuit of this goal, we conducted an interpretative single case study in a company that operates in the chemical sector in Brazil. The paper adopts a sociotechnical approach based on the Actor-Network Theory to draw attention to the sociotechnical negotiation strategies and complexity of BPM projects. The results of this paper suggest that the theoretical awareness afforded by ANT allows prominence to be given to certain factors that can affect the success/failure of Business Process Management projects, which are not considered in more traditional studies in the BPM field.

Keywords


Introduction

Business Process Management (BPM) projects have been widely accepted by organizations in recent years. BPM projects allow Information Technology (IT) resources to be combined with a procedural view to improve the structuring of the workflow and achieve a greater degree of flexibility in operations (Scheer and Nüttgens 2000; Weske 2007).

A number of studies have been involved in discussing and analyzing the characteristics of BPM projects (Scheer and Nüttgens 2000; Weske 2007). However, these approaches – which can be regarded as more traditional – implicitly, assume that a distinction should be drawn between features that can be categorized as either “technical” (material) or “social” (non-technical). These studies are thus based on a dichotomous ontology, in which an essential division is assumed between live processes (i.e. social or non-technical side) and “dead” artifacts (technical side) (Albuquerque and Christ 2012). Consequently, they fail to take account a constitutive character that BPM projects may have in organizational practice.

The researchers from the field of Science and Technology Studies (STS) criticize this duality or opposition, and argue that this premise is unable to encompass the full complexity involved in organizational situations in which social practices and the humanities are closely intertwined with technological artifacts (Albuquerque and Christ 2014). A broader approach is needed to overcome the limitations of this dichotomous perspective and evaluate BPM projects, while not assuming that there is an a priori split between social and technical factors; the projects should be regarded, in an integrated way, from a sociotechnical perspective.

This paper seeks to overcome the limitations of more traditional (dichotomous) approaches with regard to the processing of BPM initiatives. It proposes the adoption of a sociotechnical perspective that uses the Actor-Network Theory (ANT) as a reference-point because this approach sees reality as resulting from mobilization and negotiation, when viewed as heterogeneous, – human and non-human – elements
Thus, this paper is driven by the following research question: How can Business Process Management projects be viewed from a sociotechnical perspective based on the Actor-Network Theory? An interpretative single case study was employed to obtain the knowledge required to clarify what is implied in this question (Walsham 1995; Klein and Myers 1999). This was carried out in an institution that operates in the chemical sector where BPM initiative is being adopted in one of its business sectors.

**Theoretical Background**

**Business Process Management**

Business Process Management (BPM) is an approach that makes use of concepts, methods, techniques and software to support the following tasks: projection, administration, implementation, configuration and analysis of business processes (van der Aalst et al. 2003; Weske 2007). In other words, the BPM field involves both mechanisms to manage the business process and techniques to develop software and systems that can carry out the business process.

One of the most visible steps of BPM projects is Business Process Modeling, in which organizational practices are described through graphic representations. The purpose of this activity is to undertake the stipulation, definition and formalization of organizational practices in a business process model. This artifact (model) uses a language composed of a graphical vocabulary that is used to represent the workflow within the organization. After these models have been defined, they form the basis for the software development that will be carried out in the business processes.

**Actor-Network Theory**

The main tenet of the Actor-Network Theory (ANT) can be found in the metaphor of heterogeneous networks. According to this approach, society, organizations, agents and machines are all the outcome of a wide range of sociomaterial networks, or rather, networks made up of both human and non-human elements (Law 2009). From this perspective, all these players form a web of relationships called the actor-network or actant. Thus, the ANT rests on the assumption that a ‘social’ relationship does not just comprise human elements but is formed of a series of heterogeneous elements (both human and non-human), which make this interaction possible. As Latour (2005) points out, the social is thus not considered to be a domain of reality (or ‘type of material’), but rather, as a ‘type of association’ that combines human and non-human elements.

Law (2009) states that the purpose of ANT is to explore and describe local processes of social arrangement and ordering in accordance with patterns and forces of resistance. This process can also be called translation, and defined as a process of assembling or enlisting the heterogeneous elements of the sociotechnical networks around a common objective. According to Law (2009), translation forms the basis of ANT because it enables one to understand how the heterogeneous network elements can be mobilized, interwoven and maintained in a unified form. Callon (1986) systematically described the process of translation as composed by the stages: problematisation, interessment, enrolment and mobilisation.

**BPM from an Actor-Network Perspective**

On the basis of the ANT, the modeling of business processes can be understood as involving the establishment of a heterogeneous network (actor-network). The organizations should be understood as being frameworks that are made up of heterogeneous elements (e.g. functions, roles, integrated information systems, software for modeling processes etc.). Hence, in formalizing organizational practices, we are enlisting these various elements and forging close and durable ties between them with a view to obtaining a process model.

Thus, a series of translation processes is necessary to ensure a successful composition of the sociotechnical networks (Callon 1986; Latour 1988; Law 2009). The various elements are enlisted in this process with the aim of making them converge around a common objective or, in other words, a business process model. As a result, organizational forms, methods of carrying out work activities and tacit
assumptions, are negotiated while the process models are being defined. In this way, the modeling of the business processes binds the human and non-human elements in a set of relatively stable relationships (a heterogeneous network), which will be encapsulated in the business process model.

Nonetheless, the stability of these relationships is not an a priori phenomenon. As pointed out by Law (2009), the ordering of these sociotechnical networks is precarious since it can never be complete or guaranteed. Thus it is essential for the model to be constantly confirmed in the practices of an organization. In this way, the adoption of an ANT approach to understand the complexity of BPM projects, involves carrying out an assessment of the composition of these sociotechnical networks within the organizational practices and process models where they are constituted.

Methodology

The Case Study analyzed in this paper is an in-depth interpretative single case study and the unit of analysis is a BPM project taken by the sector called Products for Construction (PC) from an organization with the anonymous pseudonym IRQ. This BPM project was recently adopted by the company (less than 1 year ago) and for the purposes of this research can be regarded as a typical case, which justifies the adoption of a single case study (Yin 2009).

The data collection was carried out through: (i) semi-structured and unstructured interviews (Flick 2009) that were conducted with seven employees of the company whose activities were related to the Product and Sales process (PS); (ii) analysis of documentary material provided by IRQ (e.g. technical reports and project specification); (iii) e-mails sent to employees of the company to clarify additional issues. A protocol of the case study (Yin 2009) was produced to give support to the field research and this, together with the interview schedules (Flick 2009), was aimed at laying down the basic guidelines for undertaking the study and increasing the reliability of the case study.

After the data collection, all the interviews were transcribed and submitted to a provisional analysis which sought to determine whether or not all the topics had been covered in the field study. In cases where some missing information was detected, new contacts were established with the interviewees to clarify matters and give a more precise answer to any research questions that had not been properly dealt with. It was decided to codify the interviews and documents to improve the data analysis; the purpose of this was to analyze and define phenomena in the unit of analysis of the case study. The code used for this relied on the core concepts of the ANT that are relevant for this study (e.g. actor-network, translation, problematisation, enrolment, mobilisation) for interpreting and classifying the empirical material.

The analysis of the information that had been collected empirically was carried out on the basis of a triangulation of the data obtained (interviews, documents and e-mails), and related to the theoretical framework that was established to identify the phenomena; this was used to obtain what was of value for the research and make necessary generalizations. Walsham (1995) advises that there are four types of possible generalization in an interpretive case study: devising concepts, producing theories, making inferences from particular implications and the acquisition of a rich understanding and insights. It is hoped that the value of this paper lies in its attempt to provide a broader understanding of the sociotechnical complexity of BPM, in particular within the context of Brazilian organizations.

Case Description

IRQ is a global company in the chemicals sector. The Brazilian affiliate has more than 3,000 employees and an organizational structure comprising a wide range of areas (e.g. Sales and Marketing). This study is targeted at the Product Sales process (PS) – mainly carried out by personnel in the area of Marketing and Sales – which consists of the whole negotiation involved in the acquisition of a portfolio product by a client from outside. This process was undertaken on the basis of a particular commercial policy that determines the prices of products and the maximum discount rate that can be allowed to salesmen. As well as this, it should be mentioned that in the past, IRQ had an integrated system that prevented employees from keeping a proper register of sales and was not in compliance with commercial standards. Moreover, this policy failed to envisage any ‘exceptional situations’ where it would be necessary to...
negotiate a larger discount than that stated by the institution, such as in a bulk sale of products, special offers for strategic clients and the clearance of stock that is close to the sales expiry date.

When these exceptional situations arose, the employees relied on ‘informal practices’ (i.e. those not forecast in the PS process) to negotiate and bring about the sale of products. In other words, the salesmen made contact with the Marketing Sector so that they could obtain a reduction in the final price. Following this, the Marketing Dept. negotiated with the Control Section in an informal manner (by e-mail or on a personal basis) which checked if the discount being sought was in line with the minimum profit margin expected by the company. If the Control Section gave a positive reply, the Marketing Sector authorized the Sales Manager to allow the client to have this ‘exceptional discount’.

IRQ has a business department called ‘Internal Auditing’ which is responsible for auditing and checking whether the internal procedures of the organization conform to pre-established standards. When an internal audit was carried out for the procedures in the PC sector, a problem of non-compliance was found in the PS process. This arose after analyzing the records of the Integrated Information System of the organization had been analyzed and found that the sales records did not comply with the commercial policy of the sector. Since the information system lacked mechanisms to keep track of a series of activities that were carried out informally (e.g. the request for an exceptional discount to the Marketing Director, the approval by the Director of the corresponding business unit etc.), there was no available information to explain why the procedures carried out deviated from the policies for the sector.

The auditors suggested this problem could be overcome by creating a new software tool which was grounded on the basic principles of BPM and could formalize the activities related to the granting of discounts, when the percentage rate exceeded that laid down in the commercial policy. This suggestion was accepted by the head of the PC sector, which allocated funds for the BPM project and asked the personnel in the Information Technology (IRQ) sector to coordinate this initiative.

**Problematisation**

The initial task of the IT department was to map out all the potential actors involved in this project, i.e. all the stakeholder groups that would be involved in its execution. Table 1 list the main groups that could have an influence on the success of the BPM project:

<table>
<thead>
<tr>
<th>Actors</th>
<th>Definition/Role</th>
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<tbody>
<tr>
<td>Information Technology (IT) area</td>
<td>This department has no knowledge of organizational practices of the PS process. However, it is responsible for coordinating the BPM project. This means that their interests are closely tied to the success of the BPM project;</td>
</tr>
<tr>
<td>Employees of the PC business sector</td>
<td>This group consists of sales and marketing professionals who operate in the Product Sales (PS) process. This group had no direct interest in the BPM project, but would in principle, be interested in software tools to assist their activities, as long as these tools were aligned with their actual needs.</td>
</tr>
<tr>
<td>Internal Audit</td>
<td>This group sees the BPM project as an opportunity to adapt the PS processes so that they comply with the institutional standards and policies, thus improving the verification and auditing mechanisms.</td>
</tr>
<tr>
<td>IT Tools</td>
<td>Consist of software tools used to support the tasks carried out by Business Process Management (e.g. software for modeling, implementing and monitoring processes). These tools require job activities to be made explicit, as well as to have a clear definition of the logical-temporal relationship between these activities.</td>
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*Table 1. Actors involved in BPM project*

After analyzing this situation from the perspective of ANT, the IT department will take action by building a *set of alliances*, i.e. a durable web of relationships with these actors is established so as to enlist them, or translate their interests into the BPM project. The initial phase of the project consists of the inter-
definition of actors that influence the success of the BPM project and their respective interests. In the vocabulary employed by Callon (1986), this first stage is called *problematisation*.

When the initial project phase is seen as *problematisation*, it enables us to understand the IT department’s role in building a system of alliances so as to make the BPM project indispensable for the other actors to achieve their goals. However, the achievement of indispensability is heavily dependent on obtaining a specific result from the BPM project: the business processes models. These models are artifacts that are designed to represent the organizational practices, and are thus able to act as a consensus point between the actors/actants and their multiple goals.

At first, the goals and interests of the different actants do not seem to converge. The main concern of the IT department is to ensure that the BPM project succeeds; however, for this to occur, the auditing procedures must comply with the requirements of the project. The staff of the PC sector had no direct interest in the project, but were interested in tools that could help them in their work and meet their specific requirements. Moreover, the use of IT tools is directly tied to making a clear definition of work practices.

Thus, the BPM project had to devise business process models to deal with this question of a complexity of goals, because through their representations it would be possible to make the purposes of the organizational practices clear (requirement of the IT tools). Additionally, it would also be possible to make clear how the IT tools could meet the specific needs of the PC staff, since a clear representation of their work practices should mean they could rely on the software tools to serve their needs. At the same time, the models should assist the IT department in developing software which could meet the compliance requirements (the goal of the Internal Audit), and hence ensure the success of the BPM project (the interest of the IT department). Thus, business process models were able to act as an obligatory passage point (OPP in Callon’s (1986) parlance, i.e. this model was interposed between each of the actors and their corresponding specific goals.

*Interessment and Enrolment*

After the *problematisation* described in the previous section, the IT team must then enlist the support of the employees of the PC sector, with the goal of effectively making the BPM project an OPP for the employees, through the process of *interessement* (Callon 1986). To achieve this end, the next phase of the BPM project included the development of business process models. The IRQ's IT department had no knowledge of the employment work practices in the Product Sales (PS) process, so it had to work together with the staff from the PC unit. Thus, before it could interweave the sociotechnical network with the BPM project, the IT department had to enlist the interest of the PC employees. The strategy adopted to carry this out, was based on individual interviews and modeling workshops, and is described as follows:

- **Individual interviews** were held with marketing and sales personnel in the business units. These contacts aimed at achieving an overall view of the workflow in the PS process.

After the interviews, two workshops were held in which different employees were assembled; their descriptions of their tasks in the organization were compared, to obtain a detailed account of the flow of activities involved in the Product Sales process. Thus, a requirement of this workshop was to define a group of Key Users, who could act as spokespersons for the interests of other employees involved in the PS process.

The IT team did not know the area of business sufficiently well to choose these key users, so this task was carried out by a partnership between the IT manager and the area specialist, i.e. the employee who had some knowledge of the organizational practices and people involved in the process. The area specialist was defined as the Key User of the project and was responsible for choosing the other employees who would take part in the workshop. The criteria for choosing these key users were based on knowledge about the tasks being modeled, which entitled him to express opinions and suggest improvements.

The methodology adopted for the project was to conduct two workshops and hold some additional meetings:
As-Is Workshop: In this workshop was defined the (current) activity flow of the process. The outcome was a graphical representation (process model) that provided a formal pattern of the entire flow of the tasks. This activity involved a lot of employees, as the IT team modeled the processes in accordance with the views of the participants.

To-Be Workshop: The second modeling workshop was held with the same participants as the ‘as-is workshop’. The outcome of this workshop was a model that represents the ideal state of the PS process. In the view of one of the interviewees, the ‘to-be workshop’ was crucial for the project, since it allowed employees to build the tool in a collaborative manner and thus suited the specific needs of their business sectors.

Improvement meetings: These were meetings that occasionally took place with some of the key users, and were aimed at clarifying information and refining the flow of the tasks.

Thus, the activities mentioned above (interviews, workshops and ‘improvement meetings’) acted as an enrollment mechanism (Callon 1986), by co-opting the staff in the PC sector and showing them the advantages of the BPM project. The practice of process modeling, that was carried out during the workshops, can be interpreted from the perspective of ANT as a task of interweaving a heterogeneous sociotechnical network comprising the staff spokesmen, tools, modeling notations, knowledge of organizational practices etc. These elements were translated into the artifact, i.e. the process model. All of these activities were thus vital for the enrollment of actants (PC segment staff, IT tools, etc.).

Mobilisation

The business process model of the desired state (To-Be), served as the basis for IT employees by assisting them in the development of the software tool. When the project was completed, the IT department established a testing period, where the staff could validate the practices that had been defined in the process models, and were now being implemented in the software tool. This phase led to some corrections and allowed the software that had been developed to be implemented.

From the standpoint of ANT, the development of the software tool from the To-Be model consists of a new translation (Callon 1986; Law 2009; Latour 2005), where the organizational practices that are punctualized in the process model, are realigned in a new heterogeneous arrangement around the software tool. The IT team defined a period of assisted testing to ensure this alignment had been carried out successfully, where users could validate the software with respect to organizational practices. This process is called mobilisation by Callon (1986).

The collaborative building of the sociotechnical arrangements were thus essential to ensure the software tool was accepted by the PC staff. Therefore, there are two translations: the process models represent a punctualized network, in which the actors mentioned in the previous section are enrolled. The software development from the To-Be process model should not be seen as a direct transformation "without noise". In fact, the production of software involves a move to realign the elements of the previous network (which are constituted around the model), by translating these elements into the software tool and simultaneously composing a new network around the software. However, this new network has to maintain the same elements as those listed before, so that the validation of the software, along with the users, acts as a mechanism to ensure that these actants remain aligned in the new network.

The value of a sociotechnical perspective of the Actor-Network Theory for the BPM projects

The studies that are considered to be more traditional in the BPM field (Scheer and Nuttgens 2000; van der Aalst 2003; Weske 2007) are based on a premise and asymmetric dichotomous reality, in which it is possible to isolate the technical features (material) and social factors (non-technical) related to BPM projects and evaluate them separately. However, this dichotomous perspective is limited to dealing with everyday organizational situations, in which human practices and technological artifacts are closely interrelated.
The analysis undertaken in this paper was based on sociotechnical perspective of Actor-Network Theory as a means of overcoming the limitations of the dichotomous perspective. Thus, the sociotechnical lens of ANT allows us to see BPM projects as resulting from heterogeneous networks (human and non-human elements). Thus, process models, organizational practices and software tools for the process, do not exist a priori and of themselves, but are the result of mobilization, negotiation and translation carried out in sociotechnical networks (Callon 1986; Latour 2005). In view of this, technical artifacts and social practices co-constitute the reality and the ANT provides evidence of sociotechnical complexity in the BPM projects.

Therefore, when the approach based on ANT is compared with the dichotomous approaches, it is evident that the ANT leads to a sensibilization that allows reality to be seen as a whole, by evaluating the heterogeneous elements involved in building the BPM projects, and revealing several heterogeneous elements that are involved, as shown in Figure 1.

**Figure 1. Business Process Modeling – A Sociotechnical View**

Figure 1 – designed from the case analyzed in this paper - illustrates a series of heterogeneous elements that are marshalled and translated in the composition of this artifact (the business process model). In this enlistment of elements that co-constitute the process model, it should be noted that there are elements that are already treated by traditional BPM methodologies (e.g. key-users, process owner, modeling tools, BPM Software) and also elements that are not taken into account by traditional methodologies in the BPM field (e.g. legislation and standardization, different views of organizational processes, political disputes). It can thus be inferred that the ANT provides a broader view of reality, that is, takes account of issues or factors that directly affect the success or failure of a BPM initiative (e.g. political disputes between employees and/or areas function), but were not considered by most traditional methodologies in the BPM field. The practical implications of this approach is that it enables a future evaluation of BPM projects to be conducted in a more comprehensive way, and not simply employed to address issues arising from traditional techniques. It should also take a wider view of the sociotechnical negotiation that “negotiates the roles of 'social' and 'technical' entities alike - which modelers inevitably encounter in practice”.

The discussion in this paper led to a reinterpretation of the activities that took place throughout the BPM project, from the perspective of ANT. This means they are explicitly involved in the negotiation and mobilization of many heterogeneous elements (e.g. process models, the interests of employees; the suitability of BPM software to PS process) in a BPM initiative. Table 2 arranges the main concepts of the ANT and matches the activities related to the adoption of a BPM initiative in IRQ.
Araujo et al. IS Philosophy

<table>
<thead>
<tr>
<th>Actor-Network Concepts</th>
<th>BPM project undertaken by IRQ</th>
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<tbody>
<tr>
<td>Actant/Actor-Network</td>
<td>Employees, Information Technologies Tools; Key-Users, IT department; Internal Auditing.</td>
</tr>
<tr>
<td>Obligatory Passage Point</td>
<td>BPM project;</td>
</tr>
<tr>
<td>Enrolment</td>
<td>Individual Interviews; AS-IS and TO-BE workshops; ‘Improvement Meetings´.</td>
</tr>
<tr>
<td>Mobilisation</td>
<td>Assisted Tests with Employees;</td>
</tr>
<tr>
<td>Translation</td>
<td>To-Be Business Process Model; Software BPM design for the PC sector.</td>
</tr>
</tbody>
</table>

Table 2. Correspondence between ANT concepts and the BPM project undertaken in IRQ

The relation between the concepts of ANT and the case analyzed in this paper (Table 2), provide evidence of the complexity involved in BPM projects. The sociotechnical perspective reveals how the different elements are involved, i.e. the actants negotiate, define strategies and establish alliances, to enlist the various interests in pursuit of a common goal, and achieve success with the BPM project, - the last being an OPP for other actants concerned with their interests. Moreover, the reference-point of ANT illustrates the design of the artifacts (e.g. process models and BPM software) from a constructivist perspective, in which heterogeneous elements are enlisted.

Final Considerations

This paper has conducted an empirical analysis of the adoption of a BPM initiative in an organization that operates in the chemical industry (called by the pseudonym IRQ); by means of an interpretative single case study (Walsham 1995). This paper adopted a sociotechnical approach based on the Actor-Network Theory to draw attention to the sociotechnical negotiation strategies and complexity of the BPM projects. The main concepts of ANT have been used in the Information Systems field (e.g. Walsham, 1997). The contribution of this paper is to add and extend the work undertaken in other studies (de Albuquerque and Christ 2012; Sarker et al. 2006) that used ANT as a reference-point to handle business processes.

The ANT lens supersedes the mechanistic and dichotomous view of the more traditional approaches in the BPM field (Scheer and Nuttgens 2000; van der Aalst 2003; Weske 2007) that are simply concerned with analyzing factors that are commonly categorized as belonging to the technical world (e.g. modeling techniques, automation tools and process simulation) or simply the social world (e.g. tasks, roles, defining the process owner). From the perspective of ANT, the BPM projects are the result of a process of establishing a heterogeneous network, where different elements such as models of processes, automation tools and process integration, roles, political disputes and different views of organizational practices among others, are negotiated, mobilized, translated and punctualized in a BPM initiative (Law 2009; Latour 2005).

In this line of reasoning, it should be noted that the sociotechnical perspective based on ANT provides a broader view of reality, and reveals factors that have a direct influence on BPM initiatives. These factors are not considered in more traditional studies (that are viewed from a dichotomous perspective) in the BPM field. In this manner, the ANT perspective allows the consideration of specific issues (e.g. political disputes between employees and/or functional areas, standards and legislation, different views of organizational practice) that might hinder the adoption of BPM initiatives. Although the mainstream literature on change management for BPM mentions some difficulties involved in BPM projects, the analysis afforded by the theoretical lens of ANT goes one step further by elucidating the specific aspects that cause difficulties to change in a BPM project. Understanding these aspects would thus contribute to better managing organizational change projects such as BPM projects.

As for implications for research, the results of this paper suggest that there is a need to carry out further studies that analyze the BPM initiative, but under a broader perspective. This will make it possible to show, how to list the technical or social influences on the success/failure of BPM projects, as well as how sociotechnical negotiation between heterogeneous elements have an impact on Business Process Management projects.
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