

# A Regulation-Based View on Business Process and Supporting System Flexibility

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**Abstract.** Maintaining flexible business processes is a difficult task since a business process typically satisfies the needs of several stakeholders. In this paper we examine organizational flexibility and business processes from the point of view of the regulation of relationships between stakeholders. We then propose a set of high-level requirements for business process support systems for the maintenance of business process flexibility.

## 1 Introduction

Flexibility is an essential property for the maintenance of fit between business processes and their supporting systems (BPS) in changing environments [3]. The main question we address is how a BPS system can help an organization to maintain the fit between its business processes and its environment in the face of change.

Changes within the organization, in the organization's environment and in existing technology often introduce perturbations in business processes and their supporting systems. We propose to view flexibility as the amount of change that a process can accept in the presence of such perturbations. However, a business process is often constrained in its flexibility by the constraints imposed on it by its stakeholders. Therefore, we address the problem of business process flexibility by defining business processes as regulating the relationships between multiple stakeholders. By regulation, we mean the maintenance of a state of affairs within relatively stable bounds. It is a more general use of the term regulation as it is usually found in business language, i.e. the influence exerted on organizations through public policy. From this general point of view government regulators are viewed as one of the stakeholders influencing a business process.

We briefly examine how BPS systems can be used to maintain flexibility in business processes. Our purpose with this paper is to propose a few principles for thinking about business process and BPS system flexibility for discussion during the workshop. We do not attempt to be exhaustive on the subject of business process and workflow flexibility nor will we attempt to survey the large related work in this area.

We begin by exploring the issue of flexibility itself (Section 2). We then look into the difficulties of providing flexibility in business processes (Section 3). Finally, we

propose a set of features for BPS systems that promote flexibility in business processes (Section 4).

## 2 What is Flexibility

A dictionary definition of the term flexible is [4]:

- 1 : capable of being flexed : Pliant
- 2 : yielding to influence : Tractable
- 3 : characterized by a ready capability to adapt to new, different, or changing requirements

These definitions and synonyms suggest that something that is flexible, while yielding to influence must still resist this influence. Most if not all of the things we see, exist because they resist change. Hence, what we call flexible things are things that are neither so rigid as not to accept change at all and are neither so changeable that they fall into pieces when we attempt to change them. Change may be forced by the environment, if change is not made the organization may not survive or may face negative consequences. This equates flexibility with adaptation. Change may be motivated by internal pressures. This equates flexibility with mutation.

Flexibility therefore is the maintenance of some stable structure in the face of change. This structure is neither too stable (i.e. rigid) nor too unstable. Structure is what stands between the input and the output [10]. It could be said that for maintaining flexibility, i.e. both stability and the capability to change, we need an optimal structure, i.e. not too complicated or too simple, with respect to the challenges faced by the organization [10].

Structure is responsible for what Dietz calls the transfer function [2]. Without structure there would be no function and therefore no existence. Structure refers to recurrent patterns of the behavior of the system (the different states/actions and the relation between them) and to the construction [2] of the system (the sub-systems and their interrelations). Structure is by definition averse to change. This is both a blessing and a curse. A blessing as long as the conditions don't change and therefore as long as change is not necessary. A curse when change is necessary. For example, as noted by Weinberg and Weinberg [10], the same factors that keep us healthy are also those that prevent us from being medicated.

Structure and behavior can be studied as a set of norms- A norm can be defined as a state that doesn't change significantly within some timeframe i.e. that remains relatively stable, from the point of view of an observer. For the observer, a set of norms define the identity of the system [6]. From this point of view, a business process can be seen as a norm [6, 8]. Hence, a business process, once defined, is changed quite rarely.

Weinberg and Weinberg [10] show that the judgment about what changes and what doesn't change is often dependent on culture. This is also the case about flexibility. For example, Knoll and Jarvenpaa [3] state that an OO program is more flexible than programmable automata. This judgment obviously depends on who wants to make the change. A programmer may find the OO program to be more flexible

whereas an electronics engineer may find the programmable automaton to be more readily changeable.

Flexibility can then be defined as change that may be made to a norm in a given amount of time, without affecting other norms, whenever change is perceived as needed. This definition shows that in an organization, changes to norms require a change in perspective, or worldview. In other words, change to norms requires a change to beliefs. For example, before a business process is changed it is necessary to convince stakeholders that the current process is either faulty, or that it can be improved in some way (lower cost, more output etc). Without convincing the stakeholders, no process change is likely to occur. Hence, the responsible people need to change their beliefs about the current process and the potential benefits of a process change.

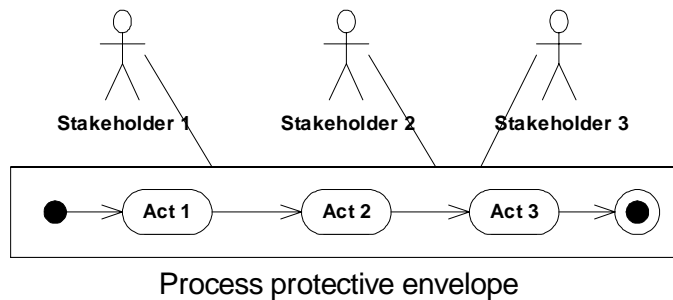
### **3 Limits on the Flexibility of Business Processes**

The commonly accepted definition of business process is a set of interrelated actions designed to reach a goal. With this definition in hand it seems that a business process is flexible if it is able to absorb change without changing its goal and/or if the goal can be changed without changing the actions. In a sale process, for example, it is possible to require that credit checking be performed regardless of the apparent financial situation of the customer or it is possible to only perform credit checking if there is reason to believe that the customer's financial situation may not be good. This does not change the goal of providing a product to the customer. Likewise, it is possible to change the end result, the goal, of the process, e.g. sell several products to a same customer without changing or removing the credit checking activity.

However, it is our viewpoint that this definition of business process and therefore business process flexibility is overly simplified. A simple example can help to see why. Consider the quintessential example of a business process, the manufacturing process. Such a process is usually seen as a set of actions required to produce a product that fits the customer requirements. Does this mean that any set of actions producing a product that fits the customer requirements form a valid process? Suppose that we design a process that produces the right product but that also releases large quantities of toxic waste into the environment. Is it a valid process? In the 21<sup>st</sup> century, we surmise that most people will agree that it is not, even though the product fits the customer requirements. Indeed, the customer may not care or even is often not aware of the released waste. Why isn't this process valid? Because the customer is not the only stakeholder of the business process. Other stakeholders, government regulators in this case, are interested in minimizing toxic waste release into the environment. The same argument can be made about a process that would waste raw material, cost too much to execute, violate corporate governance rules etc. Business processes now seem to be quite inflexible.

To better understand the limits of their flexibility, we use the regulation-based view proposed in [6] and [7]. In this view a business process is *a set of interrelated actions that regulate a set of relationships among stakeholders, the goal of the process depends on the point of view of each stakeholder.*

This definition has several advantages. First, it exposes the multiple stakeholders of a process, not only the customer. Second, using the term regulation shows that business processes are designed to maintain equilibrium between the conflicting requirements of the stakeholders. This equilibrium often takes the form of a compromise (or an accommodation according to Checkland and Scholes [1]) between these conflicting requirements. The business process is designed so that this equilibrium is maintained even when occasionally the stakeholders attempt to change this point of equilibrium. The set of actions can be seen as providing a partial protective envelope, shielding the process from the influences of the stakeholders while at the same time providing a service to these stakeholders<sup>1</sup>. As discussed in [7] some of the actions of a business process can be understood as regulative actions designed to prevent stakeholders from “abusing” the business process, i.e. from modifying the carefully constructed equilibrium. This structure obviously is somewhat immune to change and therefore has limited flexibility. Figure 1 graphically shows the resulting process model.



**Figure 1 Regulation-oriented process model.** Internal regulation (feedback based or other) is not shown

In the example of the manufacturing process, there’s obviously a tension between the customer’s desire to get the product as cheap as possible and the suppliers’, investors’ and the organization’s employees’ desire to be paid as high as possible. Government regulators also place requirements on the quality of the manufactured product and the waste produced by the process. The process has built-in actions to prevent any of these variables to deviate from the prescribed equilibrium. Actions such as batch numbering, expiration date printing, and quality control are performed in order to satisfy government regulators. These regulators are themselves influenced by customers and businesses in an endless cycle of norm setting as described by Vickers [9].

As we have seen, with respect to flexibility, the constraints imposed on the process by each stakeholder norms render the process inflexible. At the same time the participation of the stakeholders in the process as well as their norms render the process possible and flexible in another dimension. Indeed, the stakeholders’ norms provide the foundations on which the process is built. For example, the manufacturing process cannot exist without suppliers, investors, employees etc. Investors enable flexibility

<sup>1</sup> The rest of the protective envelope is provided by the other organization’s processes and construction.

by providing capital when needed to the organization but they also require a return on investment. The organization's processes are built on both these norms. In other words, there is no free lunch.

Other reasons for the inflexibility of business processes are the need for stability of the organization and its stakeholders. People in organizations need some stability after having learned a new process. Processes that change too often are ineffective, no matter what useful innovations they introduce. Organizations need to capitalize on a process, i.e. get a return on investment. A proposal to change a recently changed process is likely to be met with resistance from finance departments bent on reaping the rewards from the recent change. Change is sometimes painful for people and almost always expensive for the organization. People in organizations do not realize that a change is possible. Hence, an organization that goes through a business process change usually attempts to avoid going through another process change for some time.

#### **4 BPS Contributions to BP Flexibility**

The regulation-based definition of a business process enables us to propose a framework for improving a process's flexibility with a BPS system. The definition's main point is to provide the stakeholders of the process with information about the different points of view the stakeholders have on the process. This enables each stakeholder to have a holistic view of the process and to understand the constraints placed on the process by the other stakeholders. In some cases it may help the stakeholders to change the process and in other cases it may help them to accept the process as it is, i.e. a new accommodation will be reached.

From a high-level of abstraction, a BPS system can be seen as a knowledge management system providing its stakeholders with an understanding the business process [5]. In the previous section we have seen that this understanding requires knowledge of the stakeholders' norms and the equilibrium the business process maintains between them. More specifically, the BPS system could provide its stakeholders with the following services:

- maintain knowledge of the relevant norms the process maintains
- maintain knowledge of stakeholders' tolerances for deviations from these norms
- maintain knowledge of possibilities afforded by technology that can improve the equilibrium from one or more stakeholders' point of view
- maintain knowledge of the projected consequences of changing the norms and equilibrium point
- maintain a pool of possible actions available to the process stakeholders and advise them on the conditions of their use in the process

We refer to the above services as the maintenance of knowledge because, obviously, norms, tolerances, technology, etc. all change in time. This requires the BPS system to continually probe its environment and maintain the knowledge it provides to the

stakeholder as accurate as possible. The pool of possible actions should also be maintained so that new actions can be added to it and outdated actions can be removed. The resulting process changes are the following:

- change a stakeholder goal with respect to the process
- change a stakeholder understanding of the process
- add an action from an action pool available to the stakeholders
- add a new action to the action pool and/or process
- remove an action from pool or process
- replace an action in pool or process
- change order of actions in process

With respect to the above process changes, we propose to use BPS systems to help process stakeholders to understand the need for change of the relevant norms, the possibility to make such change, and the consequences of change and non change on their process:

- What kind of change (to goals and/or to set of actions) is requested by a stakeholder
- What kind of change (to goals and/or to set of actions) is possible through changes in available technology
- What kind changes (to goals and/or to set of actions) are necessary because of changes in the environment, e.g. competitor offerings
- Which stakeholder may be affected by an envisioned change
- What are the limits for each envisioned change
- What aspects of the process should not change
- What are the risks to the organization or to individual stakeholders is associated with a change

In some circumstances, the requirements described above should help stakeholders to understand each other's the point of view and thus prevent the business process from becoming too rigid. However, it should not be overlooked that taking too many opinions into consideration has the potential of preventing change. This can be a blessing or a curse depending on the conditions.

## 5 Conclusions

In this paper we presented an alternative definition for the concept of business process. Using this model, we proposed an initial framework for reflecting about flexibility in business processes and the role of BPS systems in fostering this flexibility. The subjects for discussion that we would like to propose during the workshop are:

- Is the concept of flexibility described in this paper reasonable?
- Are the limits on flexibility of business processes sound?

Obviously, there are many more ways with which a BPS system can improve the flexibility of business processes. Can we enumerate more of them during the workshop for further progress on this issue?

## 6 References

1. Checkland, P. and Scholes, J., *Soft System Methodology in action*, Wiley, Chichester UK, 1990.
2. Dietz, J., "Basic notions regarding business processes and supporting information systems," Proceedings of the 5th BPMDS Workshop, Riga, Latvia, June 2004.
3. Knoll, K., Jarvenpaa, S., L., "Information technology alignment or "fit" in highly turbulent environments: the concept of flexibility," Proceedings of the 1994 computer per-sonnel research conference on Reinventing, Alexandria, Virginia, United States: 1 – 14, 1994.
4. Merriam-Webster Online <http://m-w.com/>
5. Regev, G. and Wegmann, A., "Why Do We Need Business Process Support? Balancing Specialization and Generalization with BPS Systems," Introductory note to the 4th BPMDS Workshop, Velden, Austria, 2003.
6. Regev G., *A Systemic Paradigm for Early IT System Requirements Based on Regulation Principles: The Lightswitch Approach*, Ph.D. Thesis, Ecole Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland, 2003.
7. Regev, G., Alexander, I.F. and Wegmann, A., "Modelling the regulative role of business processes with use and misuse cases," *Business Process Management Journal*, 2005 (forthcoming).
8. Shishkov, B., Xie, Z., Liu, K. and Dietz, J.L.G., "Using Norm Analysis to Derive Use Cases from Business Processes," in Proceedings of the 5th Workshop On Organizational Semiotics OS 2002, Delft, The Netherlands, pp. 187-195, June 14-15, 2002.
9. Vickers, Sir G., *Polymaking, Communication, and Social Learning*, Transaction Books. New Brunswick NJ, 1987.
10. Weinberg, G. M. and Weinberg, D., *General Principles of Systems Design*, Dorset House. New York, 1988.