

Process performances and process stakeholders: a case study in the health care

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Abstract: - In this paper we introduce a multidimensional modelling of performances of business process. The first dimension is the range of performance measures that include quality, service and cost. The second one is given by the process stakeholders, who include management, customers and operators. In our view a process is sustainable if the entire range of performance is acceptable to each class of stakeholder. This multidimensional modelling enables the analyst to define a holistic measure of process performance, and it can be used both to analyze an existing process and to design a new one.

Key-Words: - business process reengineering, business process management, business process modelling, key performance indicators, performance measures, information system design

1 Business Process as a Service Chain

We define a business process as a service chain, by which one or more organizations processes a service request, made by a customer, and delivers a product or service to the customer. This simple framework can reflect a variety of real life cases, like buying a book from Amazon, processing a building permit in Government, responding to a customer order in a machinery vendor.

Actually, the concepts of business process, of flow of activities and process-oriented organizations are well-established in classic authors of business process engineering such as Hammer [5] and Davenport [3].

In the concept of "service chain" a process exists as much as it delivers a service to a customer. The importance of the service concept is witnessed by the common business practice. Actually, transportation

authorities, government authorities, health authorities and utilities publish on their web sites service statements that define the service promise to the customer. Moreover, many organizations, when outsource a service, set service level agreements, that define the service scope and service levels expected from the outsourcer. In a service-oriented environment, with the customer focus as a cornerstone [15], measuring service chains becomes a must. These "qualitative" and non-financial measures complement the financial measures necessary to management to control the efficiency, as it happens with Activity Based Costing [8]. In short, service chains are increasingly important, and their measurement becomes important too. The performance of business processes is a quadrant of the Balanced Score Card [7] and it can be seen as a standard framework of performance measurement. Additionally, service and quality performance

indicators are incorporated in a reference model of the supply chain (SCOR), a major research field in logistic management [1]. In recent years the search for process performance is driving the success of continuous improvement methods, such as Six Sigma [4].

In short, the measurement of the business process should encompass financial, service and quality variables. This wide measurement can be used (i) to control the performances of an existing process, (ii) to benchmark the performances of a given process (iii) to set the design objectives of a new process. Here we focus on point (iii).

The objective of this paper is to define a set of performance measures that help the analyst to design sustainable processes. In our view, a process is sustainable if it allows acceptable performances to all of the actors involved. They include the management, who controls the process, the customer, who makes request and receives the output and the operators, who are people who actually work on the process.

In the following sections we present the key points of our model and method. Section 2 presents the performance measures and crosses performance indicators and stakeholders perspectives. Section 3 illustrates the method steps and relations between performance modelling and the design of business process. The major novelty is in section 2. The model and the method are illustrated by a case study in the e-government in section 3.

2 Crossing stakeholders and performances

Every process involves several stakeholders. A stakeholder can be defined as an actor of the process who as an high interest in the process and can influence the performance of the process. Typical process stakeholder include the customers who receive the output, the managers who control the process, the operators who work in the process.

Each stakeholder views the process and would maximize the value from a different standpoint. The customer would minimize costs, maximize quality and squeeze times. The operator is motivated by a nice work environment, thus maximizing his own return from work. The manager would squeeze costs and maximize productivity and get the highest quality at the lowest cost.

Therefore key point to get a holistic view of process performance is to consider two measurement axis, namely stakeholder perspectives and performances indicators as shown in the high level conceptual grid of Fig. 1.

	Quality	Service	Cost	Overall	
Manager	Quality indicators for Managers	Service Indicators for Managers	Cost Indicators for Managers	Human Resources	Request
Client	Quality indicators for Clients	Service Indicators for Clients	Cost Indicators for Clients	Equipment	Output
Operator	Quality indicators for Operators	Service Indicators for Operators	Cost Indicators for Operators	Material	Other indicators

Fig. 1 : The grid stakeholder / performances

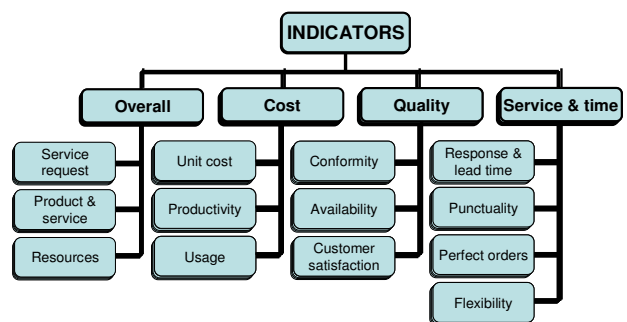


Fig. 2 : Process performance indicators

Let us now consider the axis of performances. Based on field experience we have defined a general taxonomy of performances (Fig. 2).

Overall indicators have the objective of describing the process context by quantifying the size of requests made by customers (i.e. input of the service process), outputs produced and resources used. Resources include both physical (human resources, equipment, inventory) and virtual resources such as information. These measures are relevant to benchmark or study the dynamics of the process (e.g. seasonality).

Cost indicators have the objective of measuring the economics of the process. Actually, they measure the unit cost of input or output, the productivity of resources used by the process, and the usage of resources (i.e. the rate of used resource over available resources). The meaning of some measures changes dramatically depending on the stakeholder perspectives, as we show below in this paper. Quality indicators have the objective of measuring the capacity of the process input or output of being consistent with the expected performance, and therefore include conformity measures, availability and customer satisfaction measures.

Finally, service indicators have the objective of measuring the performance against time in terms of response time, punctuality, perfect orders and

flexibility. Most of these measures are clearly customer oriented.

3 The analysis steps

Some established process design methodologies, as of ARIS [14] consider different process views, that include activity flow, organization structure and information technology. In general, process innovation ([5], [1], [11]) affects almost the whole range of organization variables and, in turn, the organizational setting affects performances (just recall the case of the assembly line against assembly islands). Therefore, we can assume the process performance is driven by some key organizational variables.

In the as-is analysis, the analyst considers the qualitative relation between the situation of organizational variables and the performance; in the to-be design, the analyst evaluates, by tests or simulation, if innovation can eventually give expected performances. If not, the analyst can come back to the design and modify it or, conversely, to re-analyze performances. We have defined a simple questionnaire, that helps the analyst to spot critical points (e.g. to identify no-value-added activities that affects efficiency and increase service times) [13].

The performance driven approach, supported by a multiple stakeholder perspective, is an iterative, almost heuristic, method. It requires an approach that differs from others used to implement Enterprise Systems, which are based on “best practices” or adapt a pre-designed normative process model to the individual process. This approach, largely used in ERP projects, gives very controversial results ([12], [17]).

The design of the actual process can also be oriented to the performance and to the stakeholder perspective. For example, UWA+ methodology [10] designs user experience and data models that incorporate the informational objectives of different stakeholder communities (e.g. the design of use cases is based on stakeholders goals, that in turn arise from stakeholders expected performance measures). Requirements stem from goals and are implemented in the use-cases.

Hence the performance analysis and the stakeholder view goes all the way down from the high level strategic analysis to the design of software.

4 Case Study

The performance model has been tested on various companies. At the beginning, it was studied in laboratory case studies at Politecnico di Milano.

Then the model was implemented to study some real cases. The last ones, still in progress, are a great Italian bank and a society that provides citizen’s transport in Milan. What is going to be presented now is the model that describe the situation at San Raffaele Scientific Institute, Milan.

4.1 The context

San Raffaele Scientific Institute (HSR), Milan, is a leading hospital for research and medical care. Its ability in innovation is recognized in the European Community (e.g. it is the first European hospital offering Tomotherapy Hi-Art treatment). HSR belongs to the San Raffaele del Monte Tabor Foundation, recognised by the Italian Ministry of Health as a “Scientific Institute carrying out biomedical research and clinical activities of relevant national interest (IRCCS)”¹. The Foundation operates internationally with AISPO (Italian Association for People’s Solidarity). AISPO is as a non-government organization (ONG) by the Italian Foreign Office and is partner, for various initiatives, of UNICEF, WHO, EU and the Italian Foreign Office.

The case defines a indicator panel regarding the logistic process of drugs and medical supports. First of all, we define the process stakeholders: management is represented by the logistic department (DAL) and information system department (DSI); the customers are the hospital units (i.e. the head nurses); the process operators are the warehouses (external and internal) and all the other operators involved in the logistic process.

4.2 Goals and indicators

The analysis was made considering the targets described by management and the inefficiencies we found during an as-is study [18]. The management asked for a new panel to track stocked products, both in the two warehouses and in the hospital unit storages. The goal is to define the stock value in the warehouses and the quantities in each single unit storage.

This analysis, at the outset, will be useful to control products, implement new solutions, control costs and increase service levels in the hospital units. Afterwards, it will be help to understand if processes are efficient or not (e.g. by benchmarking organizations).

The indicators of the management perspective are created to measure general efficiency of the logistic process. These ones are the first step for the

¹ <http://www.fondazioneanraffaele.it/>

identification of inefficiencies in the process. With the aid of Process Operators and Customers indicators, management will be able to focus on problems and try to solve them.

Indicator classes - Management	Indicators	Measures
Process costs	Average value of warehouse stocks	Average value of the goods stocked in hospital warehouses (€)
	Average stocking cost per delivery	Sum of warehouse costs / # of deliveries (€)
Process time and service level	Total delivery time	Total time needed to deliver goods to hospital units (hours)
Process quality	Cost of expired goods	Value of expired goods (€)
	Cost of stocked goods	Total value of goods stocked in the hospital (€)

Table 1: Key Performance Indicators (KPI) of the Management Perspective

The target of the hospital units, represented by head nurses, is reducing problems of stock management. Currently, these problems make almost impossible controlling the inventory in hospital units. The new indicator panel (see Table 2) will show if future policies will foster a better performance. Nowadays, it is impossible to obtain information, because there is no record of hospital unit stocks. The technology is the only one mean to provide a valid way to manage these indicators. If they will be able to have this information, they will control better the logistic flow of these items, from warehouses to their units.

Indicator classes- Customers	Indicators	Measures
Quality delivered	% of delivery complains	# of delivery complains / Total deliveries
	% of delivery errors	# of delivery errors / Total deliveries
	% expired goods	% of goods that weren't used within the date of usability

Time and service	% of delayed deliveries	% of deliveries that are late respect the standard time
	% of delay	Sum of delayed time / Time to deliver
	% of perfect orders	# orders delivered without errors / # requests
Costs	Average request value for hospital unit request	Value of requests generated by the hospital units / # of requests

Table 2: Key Performance Indicators (KPI) of the Customer

Table 3 represents the indicators related to the warehouses. These indicators are important, because low performances in these units may cause low service performances of the hospital units. The indicators, for these actors, focus on available resources, customer satisfaction and supplier performance.

Indicator classes – Process Operators	Indicators	Measures
Quality	% of complains for request (from hospital units) errors	# of request errors / Total requests
	% of line errors in supplier deliveries	# of lines delivered with errors by supplier / Total number of lines
	% of errors in requests	% of requests to warehouses that have to be modified
Time and service	Total operators time	The total hours available, calculated like sum of the hours worked by warehouse operators (hours)
	Average time available for each delivery	Total time available for deliveries / # of deliveries
Costs	Average value of items delivered	Total value of items delivered / # of items delivered (€)

Table 2: Key Performance Indicators (KPI) of the Process Operators Perspective

The case of HSR shows that, though the objective is the same (i.e. efficient flow of drugs and medical supports), the indicators change according to the actors involved, because every actor gets efficiency

by a different way. Management has a wider view; their main objective is to have the highest service at the lowest cost. The two warehouses and other logistic operators need better information from their clients (i.e. the head nurses) and suppliers, to give a better service; moreover they have to understand if their resources, allocated to the process, are sufficient. For the customers, the issue is the ability of the warehouses to respond their requests, both in terms of conformity of products and delivery time; this could be helped by a better control of items flow inside their storage units.

5 Conclusion and future work

In this paper we have illustrated the concepts of a process modelling, based on the red thread of the stakeholders' perspectives. We have discussed the key idea of customizing the performance according to stakeholders perspectives and the reason why a good design should balance the different interests of the stakeholders, i.e. management, operators and customers. Also we have suggested how the stakeholder perspectives can eventually be used all the way down, from a nearly strategic assessment of the process to the design of the Web system. The case study has shown how modelling can be customized to evaluate an e-government service chain.

Our work is continuing. Our next objective is integrating process simulation. Actually, there are a variety of self-contained simulators that allow simulating performances in term of process duration and workload on process resources. The purpose of integration is to have a quick simulation of different performance alternative and process configuration. A second objective is to build a knowledge base on e-government and alike service processes wherefrom the analyst can directly pick process configurations and test them by simulation.

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