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Innovative Performance Measurement: an Integrative Perspective of Stakeholder's View

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ABSTRACT

Business Process Management (BPM) has been increasingly focused as an holistic approach to manage organizations for better organizational effectiveness. BPM involves the use of innovative performance measurement systems to follow up, coordinate, control and improve processes and overall business efficacy and efficiency. In this paper we propose a global holistic perspective of integrated information, combining the view of all stakeholders and both qualitative and quantitative information, as a basic prerequisite for quality of information for better decision making. The paper includes findings from an empirical case study of measuring Parkinson's Disease Neurosurgery process, including stakeholder's view with an integrative perspective.

Keywords: Business Process Management (BPM), Improvement, Innovation, Integration, Process Performance, Stakeholders.

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1.0 Introduction

Business Process Management (BPM) have gradually gained in importance as an approach to improve organizational effectiveness and overall business competitiveness, as it facilitates the effective deployment of strategic objectives to processes and activities. With the extent of innovative process management focus, both the performance measurement and the rational management of stakeholders' needs and expectations came into play. Nowadays it's clear and assumed by many organizations that the way of dealing with stakeholders - listening to them, considering their interests and needs in making decisions, and treating them well and fairly - have an effect on the process and outcomes of value creation (Akao, Y. & Chan, C., 2011).

Despite the more inclusive, dynamic and relational way to conceptualize stakeholder issues (Freeman, 2004, Freeman et.al, 2007, Greenwood & Van Buren III, 2010), customer relationships are still often recognized as the main stakeholder management issue, with highest priority in competing businesses. This seems evident giving the tight competition and considering that the logic of competing undergoes change towards a relational, interaction view needed for managing service-dominant business in global markets (Savolainen & López-Fresno, 2011). But although customers 'come first' as they are more and more aware and knowledgeable of their expectations, desires and rights, understanding of the multiplicity and dynamics of stakeholder relations is a far more complex issue within and between organizations. Value is co-created and re-created in the relationships with stakeholders by negotiating, conciliating and with consensus of opinions (Freeman et. al, 2007). There exist conflicting interests having impact on the even most strategic decisions, and certain degree of the harmony of interests is pursued.

BPM involves the use of a performance measurement system to follow up, coordinate, control and improve processes and business efficacy and efficiency. A system that could be focus as a system that

transforms input data into usable information for various kinds of decisions (Kaplan & Norton, 1996; Kazandijan and Lied, 1999; Neely *et al*, 2002; Stain, 200). One of the first pre-requisites for quality of information is to incorporate information from all the actors (stakeholders) from a global holistic perspective. A process management focus requires organizations to manage and understand greater quantity of information than have traditionally seen. Two perspectives should be taken into account when defining a measurement model: internal or process based indicators (objective quality) and external or customer & other stakeholder based indicators (perceived quality). Both complementary perspectives should be integrated, in order to provide complete information for managing the organization in an effective and efficient way (López-Fresno & Fernández-González, 2007; 2008; CCS, 2005).

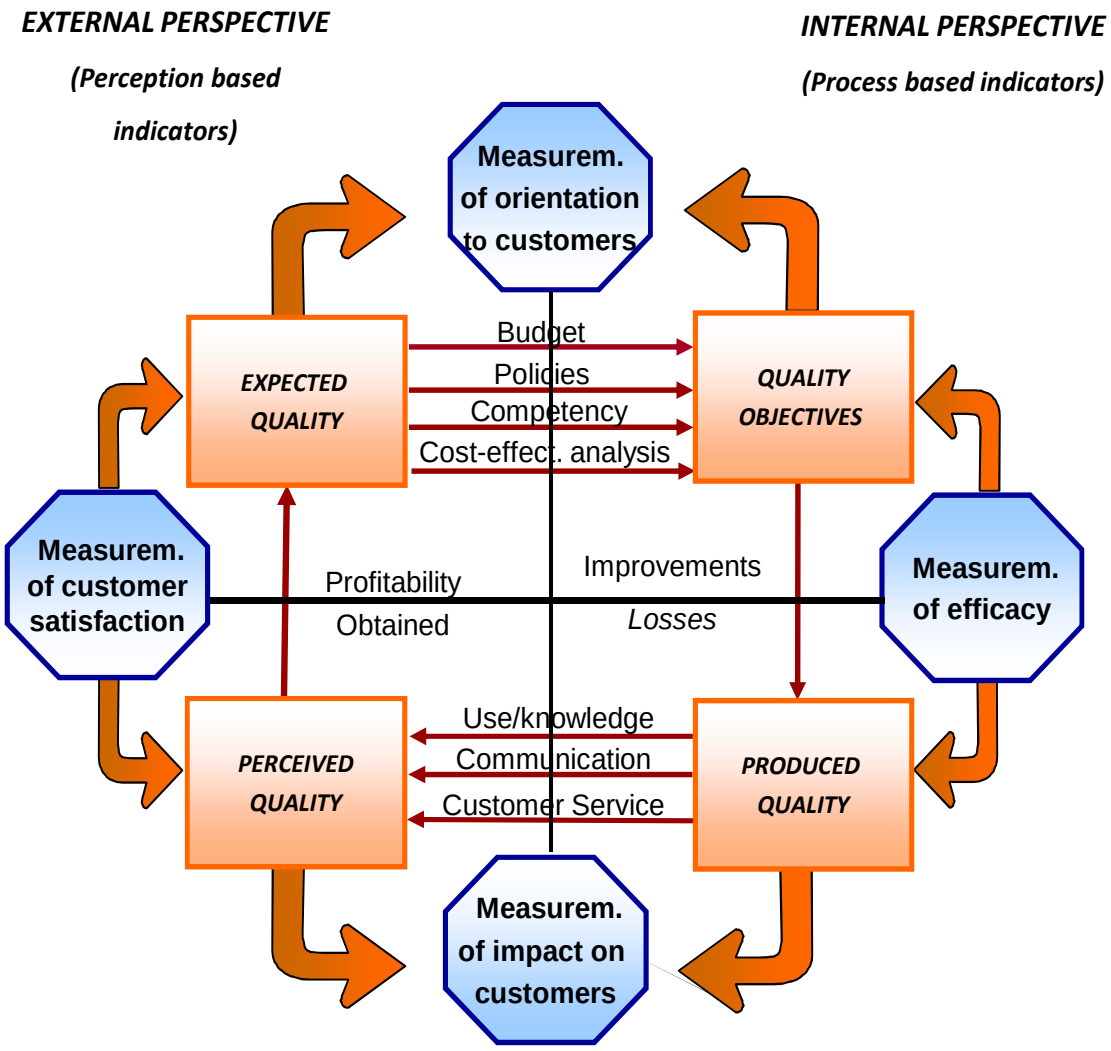

Figure 1: Service Quality Cycle

The integrated measurement model is based on the Service Quality Cycle (see Fig. 1). Customers and other stakeholders determine service requirements, those they expect to receive to fulfil their needs and

expectations (Expected Quality) and evaluate the quality of the services received (Perceived Quality), acting as auditors of the level of quality produced by the organisation (Produced Quality). The organisation determines the Quality Objectives, that is, the level of quality it proposes to achieve after considering customers and other stakeholders expectations, internal policies, cost-effective analysis, resource availability, etc. The integration of both internal and external perspectives facilitates a more effective decision making process. This cycle can be applied to all stakeholders (customers, employees, suppliers, society, shareholders, etc.).

For each process the organization should define indicators related to produced quality (efficiency, cost, time, resources, etc.) and information related to perceived quality. This latter information should be quantitative (ex.: average level of perceived performance) and qualitative (ex.: which are the main repetitive errors). Qualitative information will help the organization to better identify the causes of negative results or to anticipate these negative results.

2.0 Empirical Case Study

2.1 Background: value creation for stakeholders in hospital care

The case study focuses on ways of listening and caring for customers and other stakeholders for continuous improvement. Data were gathered from patients, families and medical staff by several methods: interviews, follow-ups, satisfaction feedback surveys, etc., combining objective and perception data as well as quantitative and qualitative information. The organization provides hospital services (Fernández-González *et al*, 2008).

The role of patients is changing from passive users into active stakeholders, being more aware and knowledgeable of their expectations and rights (Fernández-González & López-Fresno, 2003). Patients have a fundamental legal and ethical right to determine what happens to their own bodies and minds. Valid consent to treatment –consent as a patient's agreement for a health professional to provide care- is therefore absolutely central in all forms of healthcare, from providing care to undertaking major surgery (NHS Quality: Clinical Standards Development Branch, 2002).

When a patient formally gives consent to a particular intervention, this is only the endpoint of the Informed Consent (IC) process. This process may take place at one time (single stage process) or over several meetings and discussions, and can imply only a physician or several medical staff, depending on the seriousness of what it has been proposed for the patient and the urgency of the patient's condition (NHS Quality: Clinical Standards Development Branch, 2002). Each patient interaction with physicians and other medical staff involved in his or her treatment adds to the information base the patient has (Cowan, 2000), as real moments of truth (Carlzon,1985). Therefore, IC is part of a process of transference and counter transference between the physician and the patient and/or his or her family; a process between different stakeholders. In exceptional cases, IC could be done by physicians by consensus when patients cannot take a decision by themselves and do not have any family.

Parkinson's disease (PD) is a neurodegenerative process with neuronal DOPAmine deficits. The key drug in the treatment of PD is L-DOPA. Although effective early on, after several years it becomes less useful and the majority of the patients develop disabling complications. Chronic bilateral electrical Deep Brain Stimulation (DBS) through an platinum electrode implanted into the Subthalamic nucleus –a small neuronal organization with a "bean" morphology, 5mm diameter and 6mm length, located deeper into the brain- is an effective stereotactic neurosurgical procedure for treatment of motor symptoms in patients with advanced PD, who cannot be satisfactorily treated pharmacologically. This kind of neurosurgery is

carried out by a multidisciplinary team constituted by staff from Neurosurgery, Clinical Neurophysiology, Neuroimaging, Neurology and Neuropsychology services, and technical support staff.

The DBS surgery is performed in three stages:

- *First stage:* the target is localized and a DBS tetraelectrode implanted bilaterally;
- *Second stage:* polisomnographic and sleep recordings from DBS electrodes, somatosensory and motor evoked potentials, as well as magnetic resonance imaging are performed in the interval between both chirurgical stages (>72hours);
- *Third stage:* the DBS stimulator is subcutaneously implanted and the DBS tetraelectrode connected 144 hours (6 days) after surgery. During the following months, patient's habits, medication and DBS parameters are adjusted. After a year, the clinical course is considered steady. Then, a new videorecording of the neurological tests is performed.

The purpose of the case study is to show the dynamics and inter-relation between different stakeholder groups in value creation. The specific objective of the research conducted was to measure PD neurosurgery effectiveness, considering the view of the main stakeholders involved in the process of hospital care, in order to improve the DBS effectiveness. Moreover, the issue of which aspects in IC process should be improved was dealt with in order to strengthen stakeholders' trust in care (Parkinson's disease patients, families, health care professionals and other staff). The central core in the focus of the study was to take signed IC as evidence of given trust and the endpoint of the consent process, where different stakeholders are implied.

2.2. Research methodology, data and analysis

The research was performed at the Hospital Universitario Central de Asturias, Spain, a national reference center for Deep Brain Stimulation (DBS) surgery. Since 2000 to year 2005, 158 patients with Parkinson's Disease received surgery. All of them were informed and signed IC before DBS surgery. The patients were aged from 30 to 70, displaying several physiological and psychical syndroms such as rigidity, slow movements, freezing walk, emotional weakness, etc.

The research focused on quantifying effectiveness of Parkinson's disease neurosurgery DBS. This was done through the analysis of patient's satisfaction and other stakeholder's perceptions, as well as objective data. The findings of the study were meant to be used as input to drive a continuous improvement process aiming at improving treatment in Parkinson's disease.

Out of the population of patients (158), the initial 18 patients were discarded, as considered affected by the learning curve. The rest 140 patients were distributed in two groups of 70 patients each. Group A corresponds to patients treated during years 2000-2002 and group B to patients treated from 2003 to 2005. Out of the 140 patients, 109 were chosen randomly (20% + prime number = 28 + 3 samples). The size of this sample allowed sample error of 5% for a estimated probability of 95,5%. All 109 interviews performed were valid (Savolainen & López-Fresno, 2011).

Patients were assessed by two independent neurologists that indicated the surgery. In all cases, video recording of neurological clinical assessment tests (UPDRS, Tapping, etc) were performed before surgery and a year after. Moreover, after a year, an independent interviewer made structured telephone interviews to the patients and their families (given the peculiarities of Parkinson's disease, the interviews were answered collaboratively by patients and their families). The questionnaire included 25 closed questions about IC, surgical process and quality of life, and also an open variable for subjective free opinion. Using an analogue assessment procedure, an independent interviewer asked neurologists about their subjective impression of the results achieved for each patient (blind interview). The measurement process was also performed 5 years later (2010).

The research comprised data in five levels and sources:

EXTERNAL PERSPECTIVE: perception based indicators
- Telephone interviews to Patients and Families:
  - Benefits achieved in their pathological process and quality of life
  - Effectiveness of the substantiation
- Blind interviews to neurologists

INTERNAL PERSPECTIVE: process based indicators
- Study of the tests and clinical results
  - Improvement of the clinical signs and symptoms
  - Reduction of iatrogenic (suitable medication)
- Analysis of objective data (radiological and neurophysiological studies)
  - Quantification of structural changes
  - Quantification of functional changes
- Analysis of data postmortem
  - Cause of death
  - Effects derived from the process

The data from the interviews were analyzed statistically using Principal Component Analysis (PCA) and Agglomerative Hierarchical Clustering (AHC), as well as Factor Analysis. To analyze the homogeneity and the variance about clinical, neurophysiological and neuroimaging data between groups, Student's t-distribution and Fisher-Snedecor distribution were respectively used. The data in five levels mentioned above were analyzed.

2.3. Key Findings

2.3.1 Telephone Interviews to Patients and Families

Main results show that 86,2% of patients/families interviewed were very satisfied with their "quality of life". In this sense, 87,9% of them said that results from surgery were significantly good, and 87,7% indicated that they should receive surgery again, if necessary.

PCA and AHC analyses were performed. After the first one, six principal components were identified, that synthesize 72% of the variables:

- PC1: related to IC process (it corresponds in a 60,1% with the questions related to IC process).
- PC2: related to oral information and positive surgical results (in a 88,4%).
- PC3: related to which MD specialist indicated the surgery and the risks of it (in a 77,1%).
- PC4: related to information received during neurophysiological and neuroimaging tests, covering the whole surgical process (in a 84%).
- PC5: related to patients who took the IC form to home (in a 85,4%).
- PC6: related to the time interval between IC signature and surgery (in a 75,3%).

Once applied AHC analysis to these six principal components, five clusters were identified:

- C1. *Information:* expresses the debit of information on the consequences of surgery, its complications, risks, benefits and purpose of it, even when information on the neurophysiological and neuroimaging tests positively weighted satisfaction with information received. That is, patients

understood the peculiarities and indications of the neurophysiological and neuroimaging tests, but they ignored the peculiarities of the surgery and its risks.

- C2. *Informed consent:* indicates an ignorance of legal rights that assist stakeholders and a lack of inappropriate relationship with respect to the timing in which patients should have been provided or recall the IC.
- C3. *Prescriber:* indicates patients/families remembered neurologists as prescribers, but not neurosurgeon, with whom they really signed IC, and also trivialized the risks of surgery.
- C4. *Recall of information provided:* indicates that respondents recalled that the information was provided orally and in writing.
- C5. *Satisfaction with results:* indicates favorable opinions in relation with the results and acceptance of re-surgery if necessary, and coincides with the memory of having given consent based on oral information received.

Taken these five clusters as variables, and including the opinion freely expressed by patients in terms of "doing well or doing badly" as a variable, it was perceived that C1 and C2 are independent of the positive or negative results of the surgery, and both independent of C3 and C4. That is, it follows that opinions that respondents have expressed about the characteristics of information and consent are independent of the clinical results achieved. On the other hand, the memory of the information and consent are interwoven and are dependent. That is, to better information, better opinion on consent. However, the memory of who prescribed the surgery and the risks resulting from the intervention can be considered that are not statistically influenced by the results, the general information provided, or the understanding of informed consent. All analysis were performed for groups A and B, and no significant differences were found.

In summary, satisfaction with clinical outcomes is disconnected from the quality of substantiation of IC. In this sense, an excessive role by clinical neurology biased the opinion of the patients and confused them; neurosurgeon did not properly transmit its relevant role in the process; neuroimaging and neurophysiology weighted positively the process, and patients trivialized the PD neurosurgery. That is, there is not a good substantiation of the IC process; there is not a homogeneous focus of the IC process that includes all stakeholders. This may suggest that the trust of patients and their families could be more based on the peremptory need they have to improve their quality of live rather than in a structured focus.

2.3.2 Study of the Tests and Clinical Results

It was done under two perspectives: i) international standard scoring of the video recordings of clinical tests; ii) analogue assessment procedure, through subjective neurological criteria.

Clinical test that quantifies the activities of daily life (UPDRS-II) indicates an improvement of 55.5% without medication (only due to DBS effect), and 69.9% with additional medication. The scale that quantifies the quality of motor activity (UPDRS-III) shows an improvement by 52.8%, reaching a 67.5% with additional medication. The test that measures the stage of the Parkinson's disease (HOEHN & YAHR) shows a decrease by 24%, and up to 27.3% with additional medication. The test that measures the overall quality of life (SCHWAB&ENGLAND) shows a 65.2% improvement, and up to 72.8% with additional medication. In relation to medication, the year after surgery there was a reduction of 68.8%, and so an important reduction in the assumed iatrogenic effects.

As a result of processing data from patients/families interviews (clusters identified) and clinical tests, it is perceived that clinical tests show significant and positive correlation with C5, but not with the other clusters.

The analogue assessment procedure was performed by an independent interviewer. He requested the neurologists of the team to mark on an unscaled line their subjective impression of the results achieved for each patient, without access to clinical data (blind interview). The scoring of the analogue assessment shows that the one of the neurologists' opinion (neurologist G) had no correlation with any of the clusters

derived from the patients/families survey, while the other's opinion (neurologist S) has to do with prescription and risks (C3), related to trivialization of the risks of surgery.

The results of the analogue assessment were also compared with the results of scoring of the videorecordings of clinical tests. It was found that while subjective opinion of neurologist G is correlated with the UPDRS-II (activities of daily life), opinion from neurologist S does it with subjective opinion of the patients/families. That is, neurologist G seems to have substantiated his decisions on neurological objective data, while neurologist S did it on subjective data, influenced by the patients/families' expressed opinions.

Overall, results from interviews showed that 87,9% of patients/families interviewed perceived that results from surgery were significantly good. And from the scoring of activities of daily life, improvement due to DBS was 55.5%. So, patients have really improved although, however, objectively they have not improved as much as they perceived; that is, perceived quality by patients/families is higher than objective quality.

2.3.3 Analysis of Objective Data (Radiological and Neurophysiological Studies)

Data included are related to the localization of DBS electrode, obtained from the Magnetic Resonance imaging (MRi) and from neurophysiological tests.

Recording of a specific activity of the subthalamic nucleus (target) are the PGO waves (Fernández-Mendoza, J. *et al*, 2009). Detection of these waves through the DBS electrode confirms the accuracy of its localization at the nucleus. It was identified that 8.6% of the patients have the electrode localized outside the nucleus. But even when the 81.4% of the patients have the electrode at the nucleus, only 35% of them have it accurately placed in the theoretical target. The electrodes not localized exactly in the target require less voltage, less frequently, less pulse duration, to avoid undesired motor effects. With respect to the theoretical target, evoked potentials recordings indicate that stimulation is being done more posterior and deeper in 65% cases. On the other hand, Cartesian coordinates of the DBS contact, identified through MRi, indicate that the contacts related to the best PGO waves are more medial, more posterior and deeper than those located outside the nucleus.

These results suggest that most of the DBS electrodes are inside the nucleus (81,4%) but only 35% of them are accurate placed in the target. So, it can be understood that even when the DBS electrodes are not accurate placed in the theoretical target, they produce modifications of clinical picture of patients.

2.3.4 Analysis of Data Postmortem

There were not any patients dead, so analysis of data postmortem was not performed.

3.0 Summary and Conclusions

Stakeholders have different perceptions of value. In the case analyzed, while 87,9% of patients/families interviewed said that results from DBS surgery were significantly good, clinical data showed that the average of improvement in activities of daily life was 55%. Moreover, analysis of objective data (radiological and neurophysiological studies) showed that only 35% electrodes were accurately implanted in the theoretical target. So, patients have really improved after PD neurosurgery, although objectively not all of them have improved as much as they perceived. That is, perceived quality by patients/families is higher than objective quality.

Business Process Management has been increasingly seen in the last years as an holistic approach to manage organizations for better results in organizational effectiveness. A process perspective requires

organizations manage and understand greater quantity of information than have traditionally seen. Mechanisms for periodical assessment are required to evaluate process effectiveness and to identify areas for continuous improvement. Two perspectives should be taken into account when defining a measurement model: internal or process based indicators (objective quality) and external or stakeholder based indicators (perceived quality). Both perspectives should be integrated in order to provide complete information for good decision making.

In practice, the innovative performance measurement model we propose has achieved its goal of measuring the effectiveness of the PD neurosurgery and has been useful to identify five major areas for improvement:

1) The need for the neurosurgeon to recover his leadership in relation to the other stakeholders.
2) The objective data indicate efficiency, not effectiveness. Thus, scientific publications have shown that the effectiveness of DBS requires not only a subthalamic nucleus stimulation, but also to influence in the surrounding structures.
3) The criteria of uncertainty should be incorporated in the IC, so that the criteria should be indicated in terms of subthalamic region instead of subthalamic nucleus. Also, it is necessary to inform the patients that the mere mechanical impact of the electrode when being implanted could modify the clinical picture of the patient in the short term.
4) A preparation of physicians and other health care staff in transference and countertransference along the physician-patient relationship is critical.
5) It is necessary to inform the stakeholders about what could go wrong along the process.

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Authors' Backgrounds

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Dr. Fernando Fernández-González *is Medical Doctor specialized in Neurophysiology and Neurology, with more than 46 years of experience in health care and in management. He also received specific training in Biological Engineering. Apart from working as Medical Doctor, from 1982-1992 he worked with the Spanish Health Ministry as assessor for New Health Care Technologies, being Director responsible of assessment and implementation of new medical devices as innovative technologies for health care at the National Health Authority, and Advisor of the NATO for healthcare technologies.*