



the Autonomous Management School of
Ghent University and Katholieke Universiteit Leuven

Vlerick Leuven Gent Working Paper Series 2007/30

**HOSPITAL PROCESS ORIENTATION (HPO):
THE DEVELOPMENT OF A MEASUREMENT TOOL**

PAUL GEMMEL

Paul.Gemmel@vlerick.be

DARLINE VANDAELE

WIM TAMBEUR

**HOSPITAL PROCESS ORIENTATION (HPO):
THE DEVELOPMENT OF A MEASUREMENT TOOL**

PAUL GEMMEL

Vlerick Leuven Gent Management School

DARLINE VANDAELE

Ghent University

WIM TAMBEUR

University Hospitals Leuven

Contact:

Paul Gemmel

Vlerick Leuven Gent Management School

Tel: +32 09 210 98 60

Fax: +32 09 210 97 00

Email: Paul.Gemmel@vlerick.be

ABSTRACT

This paper looks at how process orientation can be measured using data from one large European University hospital. After a restructuring in divisions and the implementation of the care programs and clinical pathways, hospital management came to the conclusion that they had no tools to evaluate if these changes were resulting in a process orientation on the work-floor. In agreement with hospital management, an existing tool of business process orientation measurement was adopted and adapted to the specific context of healthcare. This paper reports on how the measurement tool was changed and validated in order to come up with a useful instrument to measure the process orientation of the employees in the hospital.

The Hospital Process Orientation (HPO) tool can be useful to measure the effects of changes which are assumed to lead to more process-orientation or even patient focus. In this way the pay-off of these investments can be made more tangible. The HPO tool offers hospitals a way to evaluate how they are evolving towards more process orientation.

Keywords: business process orientation, healthcare management, measurement tool

INTRODUCTION

During the last decade, there has been a transition from viewing the company as a number of functional departments to a business structure focusing more on the business processes being performed (McCormack, Johnson, 2001) There are many reasons why this transition has taken place, but the most important is that a process-oriented company should be more focused on the needs of the customer and should be able to deliver better value in terms of end-to-end services.

In the hospital world, process orientation has been introduced through new organisation models such as the patient-focused hospital (Lathrop et al., 1991) and the development and implementation of new co-ordination mechanisms such as clinical pathways (Zander, 1992). A change in the organizational structure or an implementation of clinical pathways does not automatically lead to more process orientation culture. Therefore, it is important for management to know to what extent the different changes compel an organisation towards process-orientation. This paper looks at how process orientation can be measured using data from one large European University hospital. After a restructuring in divisions and the implementation of the care programs and clinical pathways, hospital management came to the conclusion that they had no tools to evaluate if these changes were resulting in a process orientation on the work-floor. In agreement with hospital management, an existing tool of business process orientation measurement was adopted and adapted to the specific context of healthcare. This paper reports on how the measurement tool was changed and validated in order to come up with a useful instrument (the Hospital Process Orientation tool) to measure the process orientation of the employees in the hospital. The Hospital Process Orientation (HPO) tool can be useful to measure the effects of changes which are assumed to lead to more process-orientation or even patient focus. In this way the pay-off of these investments can be made more tangible. The HPO tool offers hospitals a way to evaluate how they are evolving towards more process orientation.

In the first part of the paper some more insights are given on what the meaning is of process orientation, more specifically pertaining to hospitals. In the second part of the paper, the process measurement tool, its adaptation, and validation for hospitals are described. Finally, some managerial conclusions are put forward.

THE PROCESS ORIENTED COMPANY

Process orientation

The traditional way to structure an organization is through the formation of departments and vertically functional units consisting of individuals with a similar area of expertise. Up to a few years ago, this way of organizing was highly dominant: people can specialize themselves within their field of expertise, the centralization of functions reduces costs, everyone knows which tasks they are supposed to perform and the structure of the organization can easily be drawn and presented. However, the functional organization no longer fits into these current characteristics of the rapidly evolving and technologically deploying business world. During the last decade, there has been a transition from viewing the company as a number of departments to focusing on the business processes being performed. The abundant literature on Business Process Management highlights this transition (Armistead, Rowland, 1998). The focus on business processes implies a strong emphasis on how work is done within an organization, in contrast to a focus on what is done. A process is defined as a specific ordering of work activities across time and place with a beginning, an end, and clearly identified inputs and outputs: a structure for action (Davenport, 1993).

Processes are generally independent of formal organizational structures, crossing functions or departments and involving people with different expertise and roles. However, formal organizational structures can strongly influence the effectiveness of processes. Consequently, the main difficulty to overcome organizational malfunctions and to break cultural barriers will be to identify an organizational structure that allows the company to focus on processes and not functions. One possibility to achieve this, is by evolving towards a more process based, horizontally oriented organization. A more conservative approach would be to set up a matrix organization, in which functional and process responsibilities interact with each other. A large survey in European companies confirms that more than 50% of the companies change their structure in the early stage of the implementation of business process management and that up to 70% do this in a well progressed stage (Armistead, Pritchard, 1999).

Very often, business process management implementations result in a flatter organization, where people are given more responsibility, get increased decision making capabilities, act more autonomous and are more flexible whenever needed. A flat organization allows managers to be close to customers and have a “first hand” awareness of the reality of

the business (Hammer, Champy, 1993). A flatter organization requires role modifications and a careful consideration of how knowledge is created and transferred across the organization.

There are several other reasons to spend more attention on business processes (Andersen, Fagerhaug, 2002):

- Focusing on processes ensures better focus on the customer;
- Value creation with regard to the end product takes place in horizontal processes;
- Defining process boundaries contributes to better communication and well-understood process requirements across the functional areas;
- Managing entire processes, operating throughout different departments, reduces the risk of suboptimization;
- Appointing process owners avoids fragmentation of responsibilities;
- Managing processes provides a better foundation for controlling time and resources.

In a process oriented organization, processes are mapped so that task responsibilities are described with a focus on processes. This form of responsibilities exceeds the functional borders and encourages all members of the different departments to collaborate and achieve common goals. It also implies the use of process oriented performance indicators, obliging the members of an organization to work together as one group. The process perspective provides an especially useful framework for addressing a common organizational problem: fragmentation or the lack of functional integration (Garvin, 1998)

Process orientation in a hospital

From a historical point of view, hospitals are considered as a collection of professional functions, brought together to care and later cure for the patients. In this way it is not surprising that historically these hospitals were organised along functional departments. The further evolution of the hospital structure has been characterised by increasing specialisation (within the functions) and centralisation (to capture economies of scales). The consequences of these evolutions were that patients are residing in small, specialised patient units supported by multiple ancillary and support departments (Lathrop et al., 1991). Such a hospital organisation involves "multiple agents who have partial information, disparate (local) goals and limited communication capabilities" (Kumar et al., 1993). According to Galbraith (1973),

there are two possible strategies to better co-ordinate the activities in such a complex organisation: (a) reducing the need for information processing or (b) increasing the capacity to process more information.

The first strategy of reducing the need for information processing has been strongly emphasised in the so-called patient-focused hospital idea which has been promoted by several American consultants (Lathrop et al., 1991). The basic idea of patient-focused hospital is that there is something wrong with the operating structure of the hospital and that the health service delivery needs to be restructured in such a way that it is centred on the patient and his needs. This involves creating more or less autonomous departments which are treating resource homogeneous patient groups, and redeploying resources to such departments and cross-training of personnel (Lathrop, 1993).

The development of more integrated information systems is a second approach to promote integration in a complex organisation. Kumar and colleagues (1993) find that the greatest benefits of integrated scheduling of ancillary services are realised when the personnel of the ancillary services do not consider their intermediate production (e.g. laboratory test) as their final output, but when the patient is placed central. In other words, accepting integration assumes a patient-focused hospital where the smooth throughput of patients is more important than the high utilisation of facilities. These ideas are further developed in the current 'patient flow' literature (Harden, Resar, 2004).

Both strategies place the patient and his needs as the starting point of attention for structuring the hospital organization. The development of clinical pathways or caremaps (Zander, 1992) in the nineties introduced a new way of working in the hospital world. Clinical pathways (originally called critical pathways) were originated from the project management methods developed during the 1950's for the manufacturing industry. They can be seen as schedules of medical and nursing procedures, including diagnostic tests, medications, and consultations designed to perform an efficient, co-ordinated program of treatment. These clinical pathways were the start of the awareness that the treatment of a patient must be considered (as a time-based) sequence of activities which are performed in a team of different professional disciplines (input) to create a certain outcome (output) (Coffey et al., 2005). The development and implementation of clinical pathways are considered as a major step in the process orientation of a hospital (Vera et al., 2007). These clinical pathways can be used in a traditional functional organisation whereby clinical pathways can be considered as projects or programs which are superimposed on the functional hospital structure.

Based on the previous discussion, it can be concluded that process orientation in hospitals can be achieved in two ways:

- By implementing coordination mechanisms (such as clinical pathways), horizontal processes are put on top of the existing vertical structure, without changing the functional organization.
- A second manner to achieve process oriented thinking is to consider the needs of the patient as the basis of the creation of a new organizational structure. This means that the ‘service line’, which contains multiple services and disciplines, will have to be optimally organized and integrated with reference to the real needs of the patient. In the extreme case, every patient can be regarded as a “project” for which specific resources are temporarily united. An aggregation of similar projects is called a “program” or a “product line” (Shortell, Kaluzny, 2000) or service-line (Hoff, 2004). In a process-based organization design, these service-lines are organised in a separate division which are profit centers and where pay for performance is the rule (Vera et al., 2007).

In other words, a process orientation can as well be present in a functional structure as in a service-line structure. A change in the organizational structure does not automatically imply an increase in process orientation. Furthermore being process-oriented is more than being patient-focused. Many of the more back-office departments (such as informatics, laboratory) in a hospital do not work directly for a patient, but deliver services to other departments. The processes in these departments must not necessarily be ‘patient-focused’, but they have to be sure to deliver the right type of service at the right time and cost to their (internal) customers. In other words ‘patient-focused’ and ‘process-orientation’ are not necessarily interchangeable labels for the same construct. In this perspective it is important for management to know to what extent the different changes (such as the implementation of clinical pathways or the adoption of a service-line structure) really lead towards process-orientation.

Process orientation in a large European University Hospital

The study of process orientation in a hospital was carried out in one of the larger university hospitals in Europe. The patient oriented reflection and the organizational change began in the early nineties. Since 1997, a reorganization initiated by a large consultancy firm has triggered a process of restructuring into divisions and decentralisation of responsibilities. This led to eleven divisions, each of them managed by three people: a clinical director, an administrative director and the head of the nursing staff. Although the divisions were composed of medical units and nursing wards which had many interactions around patient groups, the restructuring into divisions is not a guarantee for a more patient-focused process. To enhance this patient and care focus, the hospital started the development of 'care programs' as a new organizational dimension. The purpose is to define homogeneous groups of patients in order to improve the management of the care process and the allocation of resources (input) with respect to that specific patient group, aimed at achieving an explicit outcome (output). The philosophy of care programs is certainly one of process orientation, but it became clear that the implementation of these kinds of programs is not easy in an organisation which traditionally thinks in terms of functions. One of the major challenges was to bring together different professional disciplines (including physicians) to collaborate along these care programs. This inter- and multidisciplinary thinking was fostered by the development of clinical pathways in the hospital. 112 clinical pathways are already being used or are in development.

Although the aim of the restructuring was that the care programs and the clinical pathways were supposed to support a process orientation, hospital management came to the conclusion that this was not always the case. They assumed that a major factor could be the problem that hospital employees were not used to thinking in terms of processes and lacked training to develop these skills. Moreover they had the opinion that there was no comprehensive approach to assess the process orientation of their people on the work-floor.

HOSPITAL PROCESS ORIENTATION (HPO): DEVELOPMENT OF A MEASUREMENT TOOL

Business Process Orientation (BPO)

As companies are increasingly focusing on restructuring their operational thinking from a functional vertical organization towards a more process oriented horizontal organization, McCormack and Johnson (2001) developed a measurement tool which enables them to measure and quantify an organization's Business Process Orientation (BPO). In 2001, McCormack and Johnson defined BPO as "an organization that, in all its thinking, emphasizes process as opposed to hierarchies with special emphasis on outcomes and customer satisfaction." (McCormack, Johnson, 2001).

By using the measurement tool, an organization can get an insight into the following issues:

- What is BPO?
- How do I know when I have it?
- What is the impact of BPO on my organization?
- Can BPO make a competitive difference?

The measurement tool consists of 35 questions measuring seven dimensions. The seven dimensions can be further subdivided into two parts: the BPO-Components and the BPO-Impacts. The BPO-components include three dimensions:

- Process View (PV - 4 items): This dimension indicates that process orientation is defined as thorough documentation and understanding from top to bottom and beginning to end of a process (McCormack, Johnson, 2001).
- Process Jobs (PJ - 3 items): This dimension indicates to what extent the jobs and responsibilities in the organization are process oriented, encouraging people from different departments to collaborate in order to achieve common goals (McCormack, Johnson, 2001).
- Process Management and Measurement (PM – 4 items): This dimension verifies the presence of "measures that include aspects of the process such as output quality, cycle time process cost and variability" (McCormack, Johnson, 2001). This dimension specifies to what extent the performance of organizational processes is measured and analyzed.

The aggregation of the three BPO-Components indicates an organization's BPO score. In other words these components measure the process orientation.

The BPO-Impacts include the remaining four dimensions. They determine whether the BPO score results in improved organizational performance and long-term health. They deal with such issues as Interdepartmental Dynamics and Organizational Performance.

To evaluate the importance of a certain BPO score, an organization can position itself by means of the BPO maturity model (McCormack, Johnson, 2001). This model describes the different stages through which an organization must go in order to reach the goal of being fully process oriented. The BPO maturity model enables companies to benchmark themselves with competitors or other organizations, based on their relative position in the model. Moreover, the maturity model can be further detailed by including the individual scores of each BPO component and their related BPO Impacts. The detailed BPO maturity model provides information on the different domains in which supplementary efforts must be made. However, the BPO measurement tool was mainly tested in the industrial world. The services sector, and more specifically the healthcare sector, is not well represented in the benchmarking database. This implies that it is not sure whether the BPO model is completely valid for healthcare institutions.

In agreement with hospital management, the BPO tool was selected as the basic tool for measuring process orientation. Since the initial BPO questionnaire was originally designed to measure process orientation in industrial companies at a managerial level, the questionnaire had to be adapted to correspond to a healthcare environment and allow all levels of the hospital to correctly interpret the items.

Adjustments to the initial BPO items

In general, the following adjustments were made, based on interviews and discussions with hospital management:

- To measure the personal perception of a respondent with regard to the items that are stated, the items were rephrased using the "I"-form where possible. This was done to avoid that respondents would answer the questions based on a perception of what their unit's opinion would be about the items.
- As the structure of some initial items seemed incomprehensible or too complex to be directly used in the adapted BPO questionnaire, the connotation and phrasal construction was simplified.

- The terminology and expressions applied in the questionnaire were adjusted to the commonly used vocabulary within the hospital. Process terms were based on the introductory principles to BPM, and the definitions and purposes of care programs and critical pathways.
- To make the questionnaire “accessible” to all operational levels of the hospital, the choice of the words used to express the items was critically appraised to come to clear, simple and unified statements.

Construction of additional items

To broaden the scope of the BPO measurement tool and get more insight into the specific consequences related to the implementation of care programs and clinical pathways, the three BPO dimensions were enlarged with additional items. A brief description of the purpose of the additional items is given below.

- Process View (PV): This dimension was enlarged with three items measuring the knowledge about the (care) processes to which a respondent contributes, and to assess whether patients with similar needs and process characteristics are perceived as one homogenous group.
- Process Jobs (PJ): For this dimension, four additional items were formulated. The items intend to give a better insight into the respondent’s opinion about organizational aspects related to empowerment, job enrichment, decentralization of decision making and the alignment of supporting process jobs (such as administration, pharmacy, cleaning, etc.).
- Process Management and Measurement (PM): Two additional items complete the third BPO component. The supplementary items assess whether the respondents are aware of the objectives of the (care) processes to which they contribute and whether the outcome of performance indicators is used to improve these (care) processes.

A major goal of bringing in new items in the BPO survey was to cover in a more adequate way the patient-orientation and/or patient-focus as management was convinced that process-orientation and patient focus were intimately linked. The new tool is called ‘hospital process orientation’ (HPO) tool. The rewording and extension of the survey introduce the necessity to further validate the survey.

Validation of the Hospital Process Orientation tool

This section gives a brief clarification of statistical tests that were made in order to provide an insight into the reliability and the validity of the tool.

The analytical approach consists of two steps. First, the validity of the HPO components is assessed using a combination of exploratory and confirmatory factor analyses. To do this two samples were selected. A first one was a purposeful sample out of several divisions in the hospital. This sample is used for exploratory factor analysis (n=68); the other group was a sample of nurses belonging to one department (paediatrics) in the hospital (n=94). This sample was used for a confirmatory factor analysis.

Validation of HPO components

To assess the dimensionality of the hospital process orientation construct, an exploratory factor analysis is performed using the first sample group. We opt for principal axis factoring as extraction method (Conway, Huffcutt, 2003) and an oblique rotation because the determinants are not supposed to be independent ((Heck, 1998). The eigenvalue criterion suggests three factors (eigenvalues 3.9; 2.38 and 1.65). Each item has a high loading on its own dimension and a low loading on the two other dimensions (50.721% variance explained).

Five items had a high loading on the first dimension:

- The performance (efficiency and effectiveness) of the (care) processes is measured. (PM1)
- Performance indicators are defined for the (care) processes. (PM2)
- Specific performance goals are in place for the (care) processes. (PM4).
- The outcomes of the (care) processes are measured. (PM5).
- The results of the performance measurement are used to change the (care) processes. (PM7)

This factor clearly corresponds with the Process Management and Measurement dimension in the BPO tool of McCormack and Johnson (2001).

Five items had a high loading on the second dimension:

- I view the hospital as a series of linked (care) processes. (PV1)
- The (care) processes in the hospital are defined, documented with the input of the patient and in terms of benefits for the patient. (PV3)
- The (care) processes are sufficiently defined so that I know how I must work. (PV4)
- I am able to name and describe the different (care) processes of patients on the unit where I belong to. (PV5)
- I consider the (care) needs of the patient as starting point for the organisation of delivered (care) processes. (PV7).

This factor corresponds with the Process View dimension of the BPO tool.

Finally three items are loading on the third factor:

- My job is multidimensional and not simple tasks (PJ1)
- My job includes frequent problem solving (PJ2)
- I learn constantly new things on the job (PJ3)

This factor corresponds with the Process Job dimension as defined by McCormack and Johnson (2001).

To assess the reliability and validity of the HPO construct, a confirmatory factor analysis is conducted in LISREL using the second sample group. Two items (PV1 and PV7) had a low item reliability (Squared multiple Correlation < .40) and were deleted from the analysis. The three-factor model provides a reasonable fit. The chi-square (df) (53.15(41)) is significant ($p=0.097$) and the Goodness-of-Fit Index (GFI=0.91; >0.90), the Comparative Fit Index (CFI=0.98; >0.95), the Root Mean Square Error of Approximation (RMSEA=0.07; <0.08) and the Root Mean Square Residual (RMR=0.06; <0.08) are acceptable (Hair, Anderson, Tatham, Black, 1998). The three dimensions also have a composite reliability above 0.70 and an average variance extracted above 0.50 (see Table 1).

Insert Table 1 about here

The correlation between Process View (PV) and Process Management and Measurement (PM) is 0.58 ($p < 0.01$) (see Table 1). Process Job is not significantly ($p > 0.05$) correlated with the other two HPO-Components. To examine if Process View (PV) and Process Management and Measurement (PM) are distinct, a test of discriminant validity is conducted by comparing the squared correlations of PM and PV ($\sigma^2 = 0.34$) with their average variance extracted (PV: 0.55; PM: 0.70). Because the squared correlation is lower than the average variance extracted, this result indicates that PM and PV are meaningfully distinct. Appendix 1 shows the listing of items in the final HPO tool after validation.

Discussion

The previous analysis (using an exploratory factor and confirmatory factor analysis) shows that the three basic components of BPO as defined by McCormack and Johnson (2001) are valid in our specific situation of the paediatrics departments. Although the wording of some items was changed and other items were added to the survey, the basic three-factor structure of BPO is kept. This is confirmed in the exploratory factor analysis as well as in the confirmatory factor analysis. Business process orientation, and thus also hospital process orientation, means that processes are clearly documented and understood from start to end (process view), that jobs and responsibilities in the organization are process oriented, encouraging people from different departments to collaborate in order to achieve common goals (process jobs) and that the performance of organizational processes is measured and analyzed (process management and measurement).

A second observation is that many of the items as defined in the original BPO survey (McCormack, Johnson, 2001) are retained in our analysis (such as PM1, PM2, PM4 and PM5, PV3 and PV4, PJ1, PJ2 and PJ3). In the case of the dimension of process jobs, no one of the four added items are retained in the final factor analysis. This means that they do not add any added value in defining this dimension. Moreover they are also not perceived as a separate dimension. The biggest change as compared with the original BPO survey is in the items loading on the process view dimension. This confirms that most of the items as defined in the BPO components of McCormack are robust and useful even in a healthcare environment, which is fundamentally different from the business sectors where the BPO tool was validated. In other words the HPO is not fundamentally different from the BPO.

Based on the results of this validation of the HPO tool, the tool can be considered as sufficient valid to be used in the paediatrics department to measure the process orientation. Using the same data as in the confirmatory factor analysis, we found that the average score on the different HPO components in this department are respectively 3.64 (Process View), 4.50 (Process Jobs) and 2.84 (Process management and measurement) (see Table 2) on a maximum score of 5. If the scores on the items of each dimension are summed, this summation can be compared with the benchmark score which is based on the application of the BPO tool in many different sectors (McCormack, Johnson, 2001), taken into account that the number of items per dimension are the same in the HPO and BPO scale and that the items of the dimensions are not completely the same, but quite similar. If we compare the summation of the score (for each dimension) in the paediatrics department with the benchmark, it can be said that this department has already achieved a relatively high level on the process orientation components Process View and Process jobs, but a relatively low level on the component of Process Management and Measurement. In other words in the development of process orientation skills, management should spend more attention to the development of a process oriented performance measurement systems.

Insert Table 2 about here

The HPO results illustrate that the three dimensions are not necessarily strongly correlated. This is supported by the confirmatory factor analysis, which shows that the correlation between Process Jobs and Process Management and Measurement, and between Process Jobs and Process View is respectively only .12 and .47. (not significant at $P = .05$) (see Table 1). Although jobs and responsibilities in the paediatrics department are already strongly process-oriented, this is less true for the process understanding and documentation and certainly not true for the process performance measurement.

MANAGERIAL IMPLICATIONS AND CONCLUSION

Today, process management is a major point of attention in business management. This is also true for hospitals. The main driver to change the current way of working is the observation that the current functional hospital organization around professional groups is not able to deliver good service to patients. Process orientation in hospitals starts with the awareness that the flow of the patient determines the sequence of activities to be performed. Recently new models and tools such as the patient-focused hospital and clinical pathways, have been introduced in the hospital. The main goal was to increase the process-orientation. After a restructuring into divisions and the implementation of the care programs and clinical pathways, management of a large European University Hospital was curious to know whether this new process-based organisational design leads to more process orientation on the work-floor.

Based on the results of a first measurement in one department with the hospital process orientation (HPO) tool, the management of the hospital already got some indications that there is a need for more skills in terms of documenting, analyzing and improving processes and certainly in terms of performance measurement. Therefore the hospital started a project to develop the skills of employees in documenting, analyzing and improving processes. Of course hospital management hopes that these process management trainings really results into higher process orientation. A follow-up measurement with the HPO tool after the training was finished will make clear whether their training efforts will really have the expected results.

Looking at the results of the HPO measurement in the University Hospital, there seems to be a misalignment between the 3 components in the HPO tool (process view, process job, and process management and measurement). This kind of misalignment is important for the hospital manager because the process orientation of an organisation cannot be stronger than the weakest element, in this case the process performance measurement (Hammer, 2007). Without the right process measures and process-oriented skills, the right view (on processes) won't deliver the expected results (Hammer, 2007). The HPO tool can help to align the different process orientation components.

Many other hospitals are today in the process of restructuring or introducing new co-ordination mechanisms in order to obtain more process orientation. The HPO tool can be useful to measure the effects of these change processes. In this way the pay-off of these

investments can be made more tangible. The HPO tool gives hospitals a way to evaluate how they are evolving towards more process orientation.

Of course there is need for further validation of the HPO tool. Does it really apply to different healthcare institutions? Are there any other dimensions or items which should be included in the process orientation measure? And can we extend the tool through measuring the impacts of the process orientation on the organisation and the performance (as was done in the original BPO study)?

REFERENCES

- Andersen, B., Fagerhaugt, T. (2002) *Advantages and disadvantages of using predefined process models* (published on URL: <http://www.prestasjonsledelse.net/artikler.htm>, May 2005).
- Armistead, C., Rowland, P. (1998) *Managing Business Process: BPR and Beyond* (John Wiley and Sons).
- Armistead, C., Pritchard, J-P (1999) Business process management – lessons from European business, *Business Process Management Journal*, 5(1), pp.10-32.
- Coffey, R., Richards, J.S., Remmert, C.S., Leroy, S.S., Shoville, R.R., Baldwin, P.J. (2005) An Introduction to Critical Paths, *Quality Management in Healthcare*, 14(1), pp.46-55.
- Conway, J.M., Huffcutt, A.I. (2003) A Review and Evaluation of Exploratory Factor Analysis Practices in Organizational Research, *Organizational Research Methods*, 6, pp. 147-168.
- Davenport, T.H. (1993) *Process Innovation* (Boston, Harvard Business School Press).
- Galbraith, J. (1973) *Designing Complex Organizations* (Massachusetts, Addison-Wesley Publishing Company).
- Garvin, D.A. (1998) The Processes of Organization and Management, *Sloan Management Review*, 39(4), pp.33-50.
- Hair, J.F., Anderson, R.E., Tatham, R.L., Black, W.C. (1998) *Multivariate Data Analysis* (New Jersey, Prentice-Hall).
- Hammer, M., Champy, J. (1993) *Reengineering the Corporation: A Manifesto for Business Revolution* (New York, HarperCollins Publishers).
- Hammer, M. (2007) The Process Audit, *Harvard Business Review*, April, pp. 111-121.
- Harden, C., Resar, R. (2004) Patient Flows in Hospitals: Understanding and Controlling it Better, *Frontiers of Health Services Management*, 20(4), pp. 3-15.

- Heck, R.H. (1998) Factor Analysis: Exploratory and Confirmatory Approaches, in: G.A. Marcoulidis (Ed.) *Modern Methods for Business Research*, pp. 177-216 (Mahwah NJ: Lawrence Erlbaum Associates).
- Hoff, T.J. (2004) Early-stage success in Service Line Implementation, *Health Care Management Review*, 29(1), pp.17-30.
- Kumar, A., Peng Si Ow, Prietula, M.J. (1993) Organizational simulation and information systems design: an operations level example, *Management Science*, 39(2), pp.218-239.
- Lathrop, J.P., Seufert, G.E., McDonald, R.J., Martin, S.B. (1991) The Patient-focused Hospital: a Patient Care Concept, *Journal of the Society for Health Systems*, 3(2), pp.33-50.
- Lathrop, J.P. (1993) *Restructuring Health Care: the Patient Focused Paradigm* (San Francisco, Jossey-Bass Publishers).
- McCormack, K.P., Johnson, W.C. (2001) *Business Process Orientation: Gaining the E-business Competitive Advantage* (Boca Raton LLC, CRC press).
- Shortell, S.M., Kaluzny, A.D. (2000) *Health Care Management: Organization Design and Behavior* (Delmar, Thomson Learning).
- Vera, A., Kuntz, L. (2007) Process-based organization design and hospital efficiency, *Health Care Management Review*, 32(1), pp.55-65.
- Zander, K. (1992) Critical Pathways, in: M.M. Melium, M.K. Siniotis (Eds.) *Total Quality Management: the Health Care Pioneers*, pp.305-314 (American Hospital Publishing, Inc).

TABLE 1

Results of the confirmatory factory analysis (CFA)

Dimensions	CR	AVE	Correlations		
			PM	PV	PJ
Process management and measurement (PM)	0.92	0.70	1.00		
Process view (PV)	0.78	0.55	0.58	1.00	
Process jobs (PJ)	0.75	0.51	0.13	0.47	1.00

CR: Composite Reliability

AVE: Average Variance Extracted

TABLE 2

HPO scores for the paediatrics department

	No of items	Average ⁽¹⁾	Sumscore ⁽²⁾	Benchmark ⁽³⁾	Maximum
Process View	3	3.64	10.91	9.40	15
Process Jobs	3	4.50	13.50	12.50	15
Process Management and Measurement	5	2.84	14.21	16.30	25

(1) the average score on the items

(2) the sum of scores on the items

(3) the benchmarkscore as mentioned in the study of McCormack et al. (2001)

APPENDIX 1 THE HPO TOOL (AFTER VALIDATION).

PROCESS VIEW

- The (care) processes in the hospital are defined, documented with the input of the patient and in terms of benefits for the patient.
- The (care) processes are sufficiently defined so that I know how I must work.
- I am able to name and describe the different (care) processes of patients on the unit where I belong to.

PROCESS JOB

- My job is multidimensional and not simple tasks (PJ1)
- My job includes frequent problem solving (PJ2)
- I learn constantly new things on the job (PJ3)

PROCESS MANAGEMENT AND MEASUREMENT

- The performance (efficiency and effectiveness) of the (care) processes is measured.
- Performance indicators are defined for the (care) processes.
- Specific performance goals are in place for the (care) processes.
- The outcomes of the (care) processes are measured.

The results of the performance measurement are used to change the (care) processes