



Figure 1. The area of process performance measurement

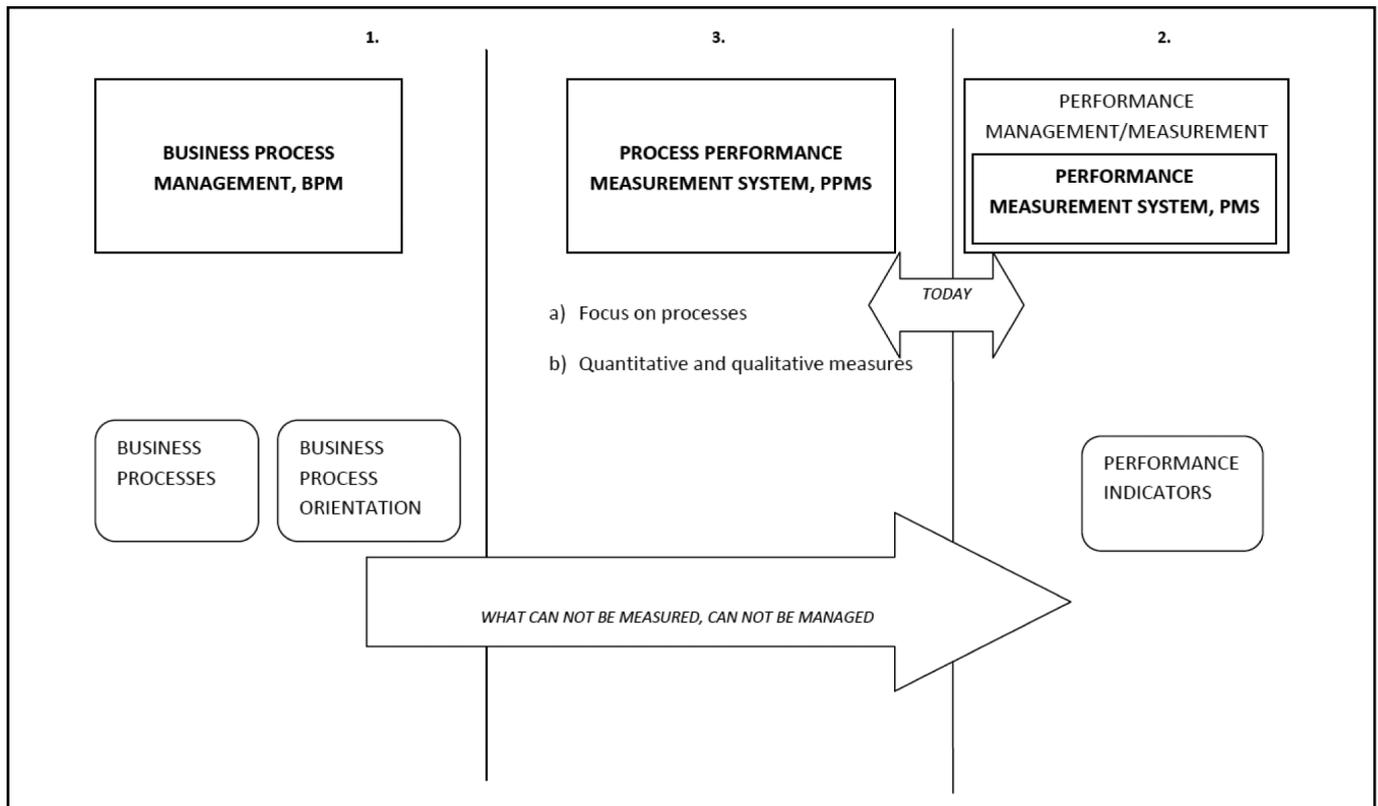


Figure 1. shows that the area of process performance measurement includes: business processes, process orientation, business process management, performance indicators, business performance measurement, PMS and PPMS. In order to understand this area all these terms are explained in the following chapters. Section 2 gives the elaboration of the concepts business process management and process orientation, which serve as a theoretical background to give relevance to business processes in process performance measurement. In the section 3 the systematization of performance measures and PMS is presented. In the section 4 PPMS is explained and different organizational performance methods, models and systems are discussed. Section 5 gives the systematic review on PPMS. Furthermore, a discussion of the results helps reflect the impact of this paper, limitations of the literature review and identify need for further research. Finally, the paper concludes with a summary and outlook.

**2. An overview of business process management area**

Organizations are continually under competitive pressure and forced to re-evaluate their business models and underline business processes (Škrinjar, Štemberger Indihar &Hernaus, 2007). Zairi (1997) defines a process as an approach for converting inputs into outputs. It is the way in which all the resources of an organization

are used in a reliable, repeatable and consistent way to achieve its goals. A business process is a coordinated chain of activities intended to produce a business result or a repeating cycle that reaches a business goal (Pourshahid, 2008). Essentially, there are four key features to any process. A process has to have (Zairi, 1997):

- predictable and definable inputs,
- a linear, logical sequence or flow,
- a set of clearly definable tasks or activities,
- a predictable and desired outcome or result.

In fact, managing a business means managing its processes (McCormack & Johnson, 2001). According to Elzinga et al. (1995) Business Process Management (BPM) refers to a systematic, structured approach to analyze, improve, control and manage processes with the aim of improving the quality of products and services. Zairi (1997) describes BPM as structured approach to analyse and continually improve fundamental activities such as marketing, manufacturing, communications and other major elements of a company’s operations. BPM relies on measurement activity to asses the performance of each individual process, set targets and deliver output levels which can meet corporate objectives. Lee and Dale (1998) state that BPM is intended to align the business processes with strategic objectives and customers needs, but requires a change in a company’s emphasis from functional to process orientation. DeToro

and McCabe (1997) say that BPM solves many of the problems of the traditional hierarchical structure because it:

- focuses on customer,
- manages hands-off between functions,
- employees have a stake in the final results and not just what happens in their departments.

The functional approach creates barriers to achieving customer satisfaction (Zairi, 1997) and that is why today's companies, in order to stay competitive, become more and more process oriented. Business Process Orientation (BPO) has many definitions and according to Škrinjar, Bosilj Vukšić and Indihar Štemberger the aspects that are included in the most of the definitions are:

- business processes have a strategic role in value creation,
- processes should be continuously improved,
- organization has a strong customer focus,
- process owners are defined and have the responsibility for the success of the processes,
- organizational structure is in line with the core process,
- process performance is measured and monitored.

Reijers (2006) interpreted BPO as the organizational effort to make business processes the platform for organizational structure and strategic planning. A process oriented organization is according to Hammer (2007) referred as process enterprise or according to Gardner (2004) as process focused organization. Although the definitions of the BPO vary, in this paper the McCormack's and Johnson's (2001) definition of BPO is adopted: an organization that emphasizes processes as opposed to hierarchies with a special emphasis on outcomes and customer satisfaction (McCormack & Johnson, 2001).

The extensive literature and former research conducted by Johnson (2001), Škrinjar (2007) and Kohlbacher (2010) suggest that organizations can enhance their performance by becoming process oriented. Furthermore, the more business process oriented an organization is, the better it performs both from the perspective of the employees as well from an overall perspective.

### 3. Performance measurement

Measurement has become such an accepted approach within organizations that considerable effort is expended in trying to identify "What" can be measured and "How" to measure it. However, few people genuinely challenge "Why" they should measure in the first place. Every measurement activity incurs costs to both implement and maintain. Without the knowledge of the exact circumstances under which a measurement system either will or will not improve the performance, it is difficult to genuinely justify the additional cost of implementing a

measurement system (Robson, 2004).

The usual argument for performance measurement tends to rely on a statement: What cannot be measured, cannot be managed (Drucker, 1993). Performance measurement can be defined as the process of quantifying the efficiency and effectiveness of action (Neely, Gregory & Platts, 2005). The function of measurement is to develop a method for generating a class of information that will be useful in a wide variety of problems and situations. Performance measurement is a mystery, complex, frustrating, difficult, challenging, important, abused and misused (Sidrova & Isik, 2010).

Numerous researches in order to explain this complex concept have exposed the definitions of terms performance measures and Performance Measurement System.

#### 3.1. Performance Measurement System and performance measures

PMS aims to integrate organizational activities across various managerial levels and functions (Sinclair & Zairi, 1995). Hronec (Neely, 2005) suggests the necessity for integration of PMS as a tool for balancing multiple measures (cost, quality, flexibility and time) across multiple levels (organization, processes and people).

PMS can be examined at two different levels (Neely, Gregory & Platts, 2005):

- (1) the individual performance measures,
- (2) the set of performance measures – PMS as an entity.

#### The individual performance measures

Every PMS consist of a number of individual performance measures/performance indicators.

Performance measures are the vital signs of the organization which quantify how well the organization achieves a specified goal (Seokjin & Behnam, 2008).

Table 1 shows the multiple dimensions of the most important measures which are quality, time, cost and flexibility (Neely, Gregory & Platts, 2005).

#### Performance measures relating to quality

Feigenbaum was the first to suggest that the true cost of quality is a function of the prevention, appraisal and failure costs (Neely, 1999). **Prevention costs** are the costs of any action taken to investigate, prevent or reduce defects and failures. **Appraisal costs** are the costs of assessing and recording the quality achieved. **Failure costs** are the costs arising from failure to achieve the quality specified. These can be divided into internal and external costs, whether they are produced within

Table 1. The most important individual performance measures

Quality	Time	Flexibility	Cost
Performance	Manufacturing lead time	Material quality	Manufacturing cost
Features	Rate of production introduction	Output quality	Value added
Reliability	Deliver lead time	New product	Selling price
Conformance	Due-date performance	Modify product	Running cost
Technical durability	Frequency of delivery	Volume	Service cost
Perceived quality		Mix	
Humanity		Resource mix	
Value			

the organization or after the transfer of ownership to the customer. Internal failure costs are costs resulting from discrepancies found prior to delivery of the product to the customer, such as the costs of rework, scrap, and material review. External failure costs are costs resulting from discrepancies found after delivery of the product to the customer, such as the costs associated with the processing of customer complaints, customer returns, field services and warranties (Neely, Gregory & Platts, 2005).

The relationship between the quality-related costs of prevention, appraisal and failure and increasing quality awareness and improvement in the organization is shown graphically on Figure 2 (Seokji & Behnam, 2008).

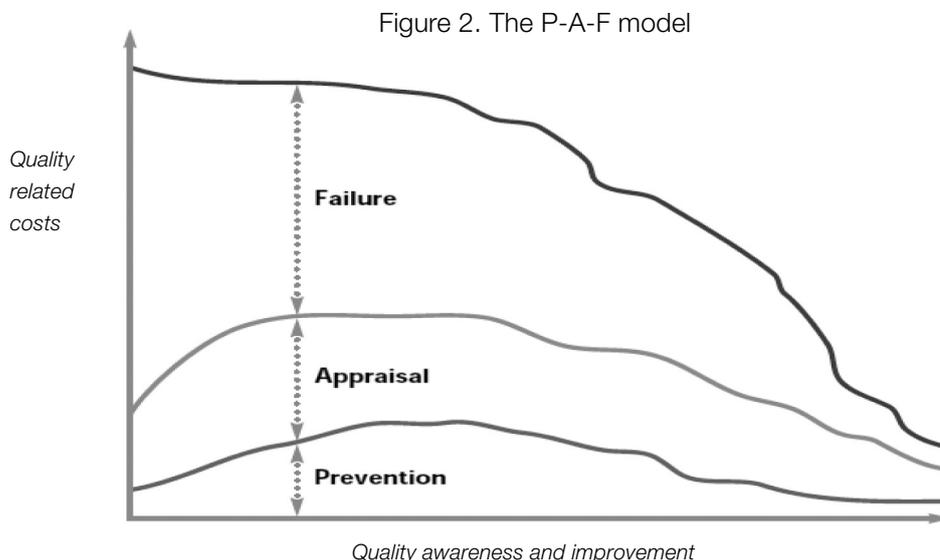
Performance measures relating to time

Example for these kinds of measures is **Throughput**

**Accounting (TA).** It is a dynamic, integrated, principle-based and comprehensive management accounting approach that provides managers with decision support information for enterprise optimization. It is an approach that identifies factors that limit an organization from reaching its goal, and then focuses on simple measures that drive behavior in key areas towards reaching organizational goals (Bragg, 2007). TA was proposed by Eliyahu M. Goldratt. Throughput Accounting is neither cost accounting nor costing because it is cash focused and does not allocate all costs (variable and fixed expenses, including overheads) to products and services sold or provided by an enterprise. Throughput takes into account the time factor.

Performance measures relating to cost

There are numerous cost accounting theories and practices today, such as return on investment (ROI) or



activity based costing (ABC) (Tupa, 2010). **ROI** is a performance measure used to evaluate the efficiency of an investment or to compare the efficiency of a number of different investments. To calculate ROI, the benefit (return) of an investment is divided by the cost of the investment; the result is expressed as a percentage or a ratio. **Activity-based costing (ABC)** is a costing model that identifies activities in an organization and assigns the cost of each activity resource to all products and services according to the actual consumption by each: it assigns more indirect costs (overhead) into direct costs (Bragg, 2007). In this way, an organization can precisely estimate the cost of individual products and services so they can identify and eliminate those that are unprofitable and lower the prices of those that are overpriced. It is generally used as a tool for understanding product and customer cost and profitability. As such, ABC has predominantly been used to support strategic decisions such as pricing, outsourcing, identification and measurement of process improvement initiatives (Tagen, 2004).

#### Performance measures relating to flexibility

Strategies of flexibility involve developing an ability to respond rapidly and in a cost-effective way to changes in the required volume for existing products, to design, manufacture and deliver new products, product characteristics or enhancements and implement new technologies. These strategies are particularly pertinent for manufacturing firms operating in highly competitive, contemporary environments, because they enable the firm to respond quickly to competitive threat or develop a product and technological opportunity. Comprehensive measures of manufacturing flexibility may be identified by examining practices which promote flexible responses while maintaining cost efficiencies and appropriate product quality standards. These practices include consideration of how flexibility is achieved at the various stages throughout the manufacturing process including design, materials supply, production process, shipping, service and marketing (Chenhall, 1996).

#### **Performance Measurement System as an entity**

The PMS can be examined as a whole. It is important that performance measures are positioned in a strategic context, as they influence what people do. A number of parallel developments have led to the notion of a (information) system that measures the performance of business enterprises in a multi-dimensional manner, that is, not solely through financial statements. In the 1980s, among other developments, the activity-based costing (ABC) and activity-based management (ABM) approaches extended the firm's performance logic beyond the purely financial by highlighting the cause-effect relationships that could explain the performance of the firm's operations and production function, thus

using financial and other types of measures. The phrase "Performance Measurement System", although already present in management literature began (Ridgway, 1956) to appear more frequently in the early 1990s, mainly in the fields of management, accounting and operations management, and was marked by Neely et al.'s (1995) founding review of the PMS literature (Marchand & Raymond, 2008). Neely et al. (1995) define a PMS as follows: PMS can be defined as the set of metrics used to quantify both the efficiency and effectiveness of actions. PMS (Kueng, Meier & Wettstein, 2001) performs the following functions:

- tracks the performance of an organization,
- supports company internal and external communication regarding performance,
- helps managers by supporting both tactical and strategic decision making,
- captures knowledge in a company and facilitates organizational learning.

PMS has to interact with a wider environment. At this highest level, the system can be analyzed by assessing (Neely, 1999):

- whether the measures reinforce the firm's strategies,
- whether the measures match the organization's culture,
- whether the measures are consistent with the existing recognition and reward structure,
- whether some measures focus on customer satisfaction,
- whether some measures focus on what the competition is doing.

#### **4. What is Process Performance Measurement System?**

A firm which adopted the process view of its organization, is concerned with the management of its business processes (Kohlbacher & Gruenwald, 2011). The process measurement can be defined as the application of the management cycle with a focus on organizational process (Kueng, 2000) and it has to be done through PPMS. PPMS is a tool to visualize and to improve process performance continuously (Kueng, 2000).

A PPMS can be characterized as an information system which (Kueng, 2000):

- (1) gathers through a set of indicators performance-relevant data of one or several business processes,
- (2) compares the current values against historical and target values,
- (3) disseminates the results (current value, target value, gap and trend for each selected indicator) to the process actors.

Process actors are the people that perform the work of a process (Bosilj Vukšić, Hernaus & Kovačić, 2008).

The main objective of a PPMS is to provide comprehensive and timely information on the performance of business processes. This information can be used to communicate goals and current performance of a business process directly to the process team, to improve resource allocation and process output regarding quantity and quality, to give early warning signals, to make a diagnosis of the weaknesses of a business process, to decide whether corrective actions are needed and to assess the impact of actions taken (Kueng, 1998).

According to Kueng (2000) PPMS is not like PMS focused on generic concepts that were introduced earlier in this paper: cost, time, quality nor flexibility, but on people who have an interest in the business process (process actors), in others' words, a stakeholder-driven performance measurement. Stakeholders of a process have to be identified. For each stakeholder or group of stakeholders, process-relevant goals have to be identified. Based on the stakeholder-driven approach, he uses the term process performance as the degree of stakeholder satisfaction (Kueng & Krahn, 1999).

The stakeholders are the following: money lenders/investors, employees, customers (suppliers and buyers) and society. Each group of stakeholders is represented by an aspect or a dimension of performance. The aspects of are as follows (Kueng, Meier & Wettstein, 2001):

- (1) financial aspects (to measure the degree of satisfaction of the money lenders/investors),
- (2) employee aspects,
- (3) customer aspects,
- (4) societal aspects,
- (5) innovation.

According to Kueng and Krahn (1999) the main functionality of a PPMS is the following:

- The PPMS collects the current values (as-is values) of individual, process-specific performance indicators. There is no generally accepted list of process performance indicators so they have to be derived either from process goals or from the means of achieving the goals.
- The PPMS compares current values against target values (to-be values) and historical values.
- The PPMS calculates 'cause-effect' relationships between the applied performance indicators. It shows the dependencies between the indicators and gives hints as to whether a certain indicator could be used as a lead indicator or an early-warning indicator.
- The PPMS disseminates the results (current values, historical values, target values, and trend) to the process actors. They can use the information provided in order to identify corrective actions (e.g. process modification, stronger IT support, training, rearranging information flow, etc.) which should lead to a higher level of process performance.

#### 4.1. Process Performance Measurement System: a necessity for modern, process based organizations

Numerous authors have proposed performance measurement models, methods and systems which are shown in Table 2 (Tatitcchi, Tonelli & Cagnazzo, 2010). The issue of what performance measures a given business should adopt is a topical and complex one (Neely, 2005).

Figure 3 (Kueng, 2000) shows positioning of the different measurement approaches according to criterion whether the measurement is focused on business units or business processes and to criterion of measuring just quantitative aspects or qualitative and quantitative aspects together. This figure also shows the difference between PPMS and other measurement approaches.

Traditional controlling (ROI) is focused on measuring performance of business units and it uses only quantitative aspects. ABC focuses on the measurement of the business processes, but mainly through quantitative aspects. ROI and ABC method were explained in earlier chapter.

Probably the most well-known approach to performance measurement is the Balanced Business Scorecard (BSC), proposed by Kaplan and Norton (2001). Kaplan and Norton divide measures into four categories of perspective (Sinclair & Zairi, 1995) :

- (1) financial,
- (2) customer,
- (3) internal business,
- (4) innovation and learning.

Kaplan and Norton (2001) began by arguing that an organization's measurement system strongly affects the behavior of managers and employees. They went on to say that "traditional financial accounting measures, like return-on-investment, can give misleading signals for continuous improvement and innovation." To counter the tendency to rely too heavily on financial accounting measures, Kaplan and Norton argued that senior executives should establish a scorecard that takes multiple measures into account (Tupa, 2010). They proposed a BSC that considered four types of measures:

- (1) Financial Measures: How Do We Look to Shareholders?
  - (2) Internal Business Measures: What Must We Excel At?
  - (3) Innovation and Learning Measures: Can We Continue to Improve and Create Value?
  - (4) Customer Measures: How Do Customers See Us?
- An important characteristic of BSC is that the tool is focused on corporations or organizational units such as strategic business units, not on business processes. It

Table 2. Methods, models and systems for performance measurement

<b>Period of introduction</b>	<b>Name of the model/framework</b>	<b>References</b>
Before 1980s	The ROI, ROE and derivatives	Simons (2003)
1980	The Economic Value Added Model, EVA	Stewart (2007)
1988	The Activity Based Costing, ABC	Cooper and Kaplan (1998)
1989	The Supportive Performance Measures, SPA	Keegan (1989)
1990	The Customer Value Analysis, CVA	Customer Value Inc. (2007)
1990	The Performance Measurement Questionnaire, PMQ	Dixon (1990)
1991	The Results and Determinate Frameworks, RDF	Fitzgerald (1991)
1992	The Balance Scorecard, BSC	Kaplan and Norton (1992)
1994	The Service Profit Chain, SPC	Heskett (1994)
1995	The Return on Quality Approach, ROQ	Rush (1995)
1996	The Cambridge Performance Measurement Framework, CPMF	Neely (1996)
1996	The Consistent Performance Measurement System, CPMS	Flapper (1996)
1997	The Integrated Performance Measurement System, IPMS	Bittici (1997)
1998	The Comparative Business Scorecard, CBS	Kanji (1998)
1998	The Integrated Performance Measurement Framework, IPMF	Medori (2000)
1999	The Business Excellence Model, BEM	EFQM (2007)
2000	The Dynamic Performance Measurement System, DPMS	Bittici (2000)
2001	The Action Profit Linkage Model, APL	Eppstein (2001)
2001	The Manufacturing System Design Decomposition, MSDD	Cochran (2001)
2001	The Performance Prism, PP	Neely (2001)
2004	The Performance Planning Value Chain, PPVC	Neely (2004)
2004	The Capability Economic Value of Intangible and Tangible Assets, CEVITA	Ratnatunga (2004)
2006	The performance, Development, Growth Benchmarking System, PDGBS	St-Pierre (2006)
2007	The Unused Capacity Decomposition Framework, UCDF	Balachandran (2007)

Figure 3. Different measurement approaches

	<b>Focus on Business Units</b>	<b>Focus on Business Processes</b>
<b>Qualitative And Quantitative Aspects</b>	<b>BALANCE SCORECARD</b>	<b>PROCESS PERFORMANCE MEASUREMENT SYSTEM</b>
<b>Quantitative aspects</b>	<b>TRADITIONAL CONTROLLING</b>	<b>ACTIVITY BASED COSTING</b>

looks at business processes only as far as they have a great impact on customer satisfaction and achieve an organization's financial objectives (Kueng, 1998).

So which measurement system is appropriate? It depends. Taking into account the view that a modern Performance Measurement System should support a process-oriented view, companies need a Process Performance Measurement System.

In other words, process oriented companies must have PPMS, a system which fulfills two requirements (Kueng, Wettstein & List, 2001):

- (1) The measurement system should be focused on processes, not on organizational units.
- (2) The measurement system should evaluate performance by measuring quantitative aspects as well as qualitative aspects.

**5. A systematic review on Process Performance Measurement System**

A systematic review is a research methodology which is developed to gather, evaluate and analyze all available

research relevant to a particular research question or area of interest (Gonzalez, 2010).

**5.1. Question formulation**

The RQ is: What is the current state of research on PPMS?

According to the Figure 1 which shows the area of process performance measurement the list of keywords used to find the answer to this RQ was:

- (1) Search terms I = business process management, business processes, business process orientation
- (2) Search terms II = performance measures/indicators, business performance measurement, Performance Measurement System
- (3) Search term IV= Process Performance Measurement System

A search was obtained by taking the keywords shown above using the operator or. The majority of the documents used to answer RQ, and therefore carry out

Table 4. The quantitative overview of search terms

	Date of search	Years covered by	Journal databases/ Online libraries	Full text	Item title
Search terms I	09 November 2011	1985-2011	JSTOR	646648	169
Search terms II	09 November 2011	1985-2011	JSTOR	113880	95
Search terms III	09 November 2011	1985-2011	JSTOR	71	0
Search terms I	09 November 2011	1985-2011	Springer	318987	429
Search terms II	09 November 2011	1985-2011	Springer	314750	337
Search terms III	09 November 2011	1985-2011	Springer	179201	3
Search terms I	09 November 2011	1985-2011	Ebsco&EconLit	174550	2542
Search terms II	09 November 2011	1985-2011	Ebsco&EconLit	12222	449
Search terms III	09 November 2011	1985-2011	Ebsco&EconLit	514	9
Search terms I	09 November 2011	1985-2011	Wiley	261470	233
Search terms II	09 November 2011	1985-2011	Wiley	287177	60
Search terms III	09 November 2011	1985-2011	Wiley	30000	0
Search terms I	09 November 2011	1985-2011	Hrčak	6	1
Search terms II	09 November 2011	1985-2011	Hrčak	6	1
Search terms III	09 November 2011	1985-2011	Hrčak	0	0

Table 5. Systematization of terms

articles \ terms	Business process, BMP, BPO	Performance measures, business performance measurement, PMS	PPMS
Kolbacher M., Gruenwald S. (2011.)	•		•
Gonzalez L., Rubio G. (2010.)	•	•	
Kolbacher M. (2010.)	•		•
Taticchi P., Tonelli F., Cagnazo L. (2010.)	•	•	
Tupa J. (2010.)	•		•
Bosilj Vukšić V., Milanović Lj., Škrinjar R., Indihar Štemberger M. (2008.)	•	•	
Najmi M., Fan J. (2005.)	•	•	
Neely A. (2005.)	•	•	
Neely A., Gregory M., Platts K. (2005.)	•	•	
Kaplan R., Norton D. (2001.)	•	•	
Kueng P. (2000.)	•	•	•
Neely A. (1999.)	•	•	
Bittici U., Carrie A., McDevit L. (1997.)		•	
Zairi M. (1997.)		•	
Sinclair D., Zairi M. (1995.)	•	•	

the systematic review, were found in the following list of sources:

- (1) JSTOR,
- (2) Springer,
- (3) Ebsco&EconLit,
- (4) Wiley,
- (5) Hrčak.

## 5.2. Results

Table 4 shows the quantitative overview of mentioned search terms in different journal databases and online libraries. The search terms were included either in full text or either in the title of the articles. Years covered by search were from 1985 till today. The analysis showed that today there is:

- (1) an extensive literature on BPM, BPO and business processes,
- (2) an extensive literature on performance measurement, performance measures and PMS

- (3) less literature, even the lack of literature on PPMS. Only twelve articles that have the term PPMS in the title were found in these databases.

Further analysis is shown in Table 5. It gives the systematization about the searched terms in the articles of the most cited authors. The most cited foreign and Croatian authors in the reviewed journal databases and online libraries whose research field is process performance measurement are also listed in this table. The table shows that search terms I and II are well known and used in the literature, but it also shows that the last concept that was introduced into the literature is search term III or PPMS. This concept was first introduced by Peter Kueng in 2000, but it became more often and more mentioned only since 2010.

The Table 4 as Table 5 also shows the lack of PPMS concept in literature.

## 6. Results and discussion

Kueng stated (2001) that PMS still lack effective measurement of nonfinancial aspects and that they are not focused upon business processes. Although business process orientation, business process improvement, process management and many other similar terms have been used for a longer time, most enterprises do not have an integrated, holistic system of gauging their business process performance on a regular basis or in other words they don't have PPMS.

Provided literature analysis also implicates that there is a lack of the research on PPMS. The results of this systematization and literature review gave an answer to research question: today's performance measurement systems are still not focused upon business processes. Process performance measurement is a necessity for a modern, process-oriented organization and that is why a new measurement approach is needed, an approach which helps a company to establish a process-based organization where the resources are allocated to a process owner or process manager. In such an organization, it will be crucial for the process manager to have a PPMS in their organizations: a tool which is able to assess process performance in an integral way and which is essential for enterprise continuous improvement.

The limitations of this study are:

- (1) The paper is based only on the literature review, not on empirical research.
- (2) Only by relying on the automated search based on matching words, this literature review maybe excluded some literature that could provide more insights to this topic.
- (3) PPMS is relatively new topic of research. Regardless of the fact that PPMS concept was introduced in 2000, the foreign and especially croatian literature shows the lack of articles and case studies on this topic. These studies became more often only recently, in the last two years.

The results of the literature review call for further research on this topic. The future research will consider the following aims:

- (1) Developing a conceptual model of the given problem. According to Čerić (1993) models are divided on: material, mathematical, computer and conceptual models. Conceptual model is a type of diagram which shows a set of relationships between factors that are believed to impact or lead to a target condition; a diagram that defines theoretical entities, objects or conditions of a system and the relationships between them.
- (2) This model will be developed in order to conceptualize PPMS and present the steps for designing and building PPMS in organization. The steps of the conceptual model for implementing

PPMS will be explained in details and based not just only on literature review, but also on qualitative research through interviews that will be conducted in Croatian companies.

- (3) Determining the state of business process orientation and performance measurement in Croatian companies, through quantitative research using surveys.

## 7. Conclusion

During the past few years many organizations have adopted a concept of a process oriented company. In this context, assessing process performance is essential because it enables individuals and groups to assess where they stand in comparison to their competitors. Answering the research question *What is the current state of research on PPMS* this paper provides some insights in the area of process performance measurement with focus on PPMS.

Based on this systematic review, three research objectives have been achieved:

- (1) systematization of the terms connected with business process management and business performance measurement is provided,
- (2) the literature review on PPMS and different organizational performance methods, models and systems are offered,
- (3) potential future research in this field is derived.

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