The Role of Performance Measurement Systems between Assessment Tool and Knowledge Repository

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Abstract

Performance measurement is a knowledge intensive business process and performance measurement systems (PMS) are appropriate tools to collect relevant performance information. Though, the application of many PMS fails. Therefore, there is a vivid debate in the literature about the right design, implementation, and use of PMS. Other contributions describe specific obstacles in different contexts, but there is no thorough investigation of the underlying patterns, especially in the context of information supply. This paper delivers a literature review aiming at explicating the reasons for failure in order to identify patterns and implications for PMS improvement. The findings suggest that involved people have difficulties with the PMS and there the problem is not in PMS itself. They emphasize the need to improve the knowledge related side of performance. In particular, a lack of understanding of PMS results and purpose demands better information supply and quality to foster their personal and organizational adaption.

1. Introduction

The main goal of Business Process Management (BPM) is to increase business value through better efficacy and process performance. This assignment is addressed by the function of process controlling, in particular via performance measurement [109]. Performance Measurement Systems (PMS) are used as the information system of choice to collect, display, and communicate performance information to the stakeholders. Primarily, they are built to assess the health of an enterprise, but they also can be used to measure the performance of designated Knowledge Systems (KS) via suitable indicators and perspectives. Moreover, they operationalize a knowledge intensive business process [40], in this case performance measurement and act as a collector and carrier of information and domain knowledge themselves. This might lead to the expectation that PMS are established instruments to assess performance as well as they are used as convenient information and knowledge repositories. But practical experience suggests and empirical research proves that many applications of PMS fail in enterprises. De Waal [39] claims that 56% of all PMS projects are not successful. BARC [9] identifies that 80% of the studied enterprises seek for improvement of their performance management related processes. 59% of all companies lack an appropriate tool support for analysis [35], 53% of all companies complain that their measures are inappropriate to anticipate future developments, 21% of them are even unable to determine the actual state and health of their company [36]. These observations, which stay constant over the last years, provoke the question what reasons actually prevent the PMS from working properly. Hence, the goal of this paper is to gain an understanding of the problem of unsatisfactory PMS application, especially in the context of information and knowledge supply.

There are some few critical contributions that actually discuss the problems of PMS especially in the context of appropriate communication and information delivery, e.g. [58], [60] or [91]. Some other structured literature reviews list a diversity of obstacles, e.g. [21], [23] or [46], but a thorough examination, classification, and derivation of patterns behind the reasons are still missing. This paper contributes to the discussion about PMS by a state of the art review about the failure of PMS. This is done by collecting, categorizing, and interpreting the drawbacks that are mentioned in the literature in order to find patterns or solution approaches and to derive appropriate hypotheses for future research.

The remainder of this paper is as follows: Section 2 explains the problem area, explicating its relevance and evidence leading to the research questions. Section 3 depicts the research design, methodology investigation and findings. Section 4 consists of the results, explains the benefits of the contribution and gives an outlook on future research.
2. Problem statement

Improving the performance and competitiveness of business activities requires the right information at the right time for the right stakeholder (e.g. [15], [20], [60], [83] or [91]) in order to reduce uncertainty and take appropriate decisions ([19], [98]). This degree of comprehension of business process performance with the help of appropriate indicators and a certain oversight on performance information has been introduced as visibility [35], [36], [95]. It refers to a certain quality and usability of information. A lot of contributions discuss the aspect of communication and information generation and supply of PMS in various contexts (e.g. [37], [47], [49], [74], [84], [99], [102] or [104]), but do not systematically discuss or analyze obstacles in communication or reasons for informational failure. With communication being one of the principal five purposes of a PMS according to Franco-Santos et al. [47] this fact seems to be surprising and points to an assumed research gap and an entry point for investigation.

The fundamental research problem is why PMS do not comply with their promises. From this problem, following seven research questions arise:

RQ1. Are there specific contributions on that issue?
RQ2. Are there reproducible viewpoints from which patterns of the problem structure can be observed?
RQ3. Can specific obstacles and reasons that avoid a proper PMS function be actually identified and classified?
RQ4. Are there any framing criteria that can help to explain or interpret the reasons for PMS faults?
RQ5. What specific findings can be made based on the analysis and interpretation of the results of the investigation?
RQ6. Are there any visible research gaps?
RQ7. Derived from these findings and gaps, can hypotheses for future work be formulated?

To get back to the research questions, an appropriate research method has to be chosen. The discussion on PMS is rather broad, often combines multiple aspects and usually contains qualitative information. Moreover, models and schools of thought are changing and evolving over time. Hence, the research method must be adequate to obtain a cross-cut overview of a large number of contributions and also to examine the development of the topic in time. To thoroughly examine the body of knowledge in this area, a systematic literature review approach (state of the art) was chosen. Applied to contributions of academic research and practical experience on the topic, it allows the extraction of relevant literature, the evaluation of their contents in the context of the research questions, and the establishment of an explanatory framework. Adequate categorization and mapping to topical clusters do not allow qualitative findings, but do provide a quantitative analysis that supports the identification and explanation of patterns to deliver a valid state-of-the-art. The following section explains the used research design in detail.

3. Research design and investigation

The research design starts with the explication of the problem, the motivation and the relevance of the research topic. These points were already discussed in Section 2. In this Section, the fundamentals of the research methodology are discussed. It consists of the explanation of the chosen procedure for creating a state of the art review, followed by the explication of the specific steps for literature collection and compilation. It also includes its analysis by building five suitable categories as well as their interpretation. Figure 1 depicts the research design as used in this contribution.

3.1. Methodology

We use the procedural model of Fettke [43] to create a state-of-the-art review. According to this method, five steps have to be processed in order to evaluate, describe, analyze, summarize or integrate the findings of previously published examinations. The first step in this model is the problem formulation, where the scientific goal is formulated and combined with research questions or hypotheses that arise out of this goal. In the next step, all activities that contribute to the literature search (choice and consolidation itself) are explicated in order to guarantee the traceability of the research. Intersubjective assessability of the research contents is supported by using procedures to evaluate, systemize, and integrate relevant literature (step three). Based on these findings, the contents of the literature are statistically processed and interpreted. Finally, the results of the state-of-the-art are presented, in this case along with the dedicated text. The complete procedural model is depicted in Fig. 2.
The problem formulation, step one in the procedural model has already been explicated in Section 2. The next paragraphs deal with the literature search and subsequent evaluation steps.

### 3.2 Literature search

We have scanned academic literature databases by using specific search terms. The databases we used were Academic Source Complete (ASC), Business Source Complete (BSC), both browsed as one repository under EBSCO, SCOPUS, IEEE Xplore Digital Library (IEEE), Springer Link (SL), and Google Scholar.

In the academic literature, there is neither a clear and undisputed notion of the term performance management (system) in the context of organizational performance nor a clear distinction between performance measurement and performance management available. For example Neely et al. [89] define a performance measurement and management system as balanced and dynamic system that enables support of decision-making processes by gathering, elaborating, and analyzing information. Others try to explain both terms in a single delimitation. Lebas [68] characterizes a performance management system as the organization-wide philosophy supported by performance measurement. According to Horvarth [127], performance management includes all activities, events, and ways to achieve or adapt goals. Performance measurement is therefore the activity of collecting the underlying measures, which is also expressed by Brudan [29]. He distinguishes between performance measurement, which deals with the evaluation of results, and performance management which deals with taking action based on these results and ensuring that the targets are achieved. Adair et al. [3] characterize performance management as the application of information and knowledge arising from performance measurement systems. Kueng et al. [65] consider a performance measurement system as an information system, which should integrate all significant information from relevant systems in support of performance management. This is the process by which the company manages its performance.

In principle, both terms are used synonymously and interchangeably in the majority of the literature. This is also reflected in the abundance of identical search results for both terms in a test run. Hence, the search was restricted to the term performance measurement system and the subsequent words. The search was performed in abstracts, titles, interest areas, and keywords of available articles. A first overview revealed that roughly 50 percent of the results originated in general management science, 50 percent in operations management or the field of finance, controlling, and accounting. As there is no independent way of assessing the overall relevance and quality of any contributions in this mixed field, search was restricted to the minimum quality benchmark of publications in peer-reviewed academic journals. Book chapters and reviews as well as conference proceedings were excluded from the search results as they might contain untested material, which should not be part of common sense in these academic fields.

There is consensus that the discussion about performance measurement fully emerged in practice and the academic literature in the early 1990s by the introduction of the Balanced Scorecard of Kaplan and Norton in 1992. Some sources even claim a revolution in this field after its publication (e.g. [29], [91], [93] or [116]). Hence, the search for appropriate literature was fixed to a timeframe from 1990 to 2011. Summing up, 4471 articles were found in the main databases after this first iteration step (approximately 200 publications per year). The databases, which delivered the most articles, were EBSCO, SCOPUS, and IEEE. The historic distribution of articles is shown in Figure 3.

![Fig. 3 Historic distribution of related contributions](image)

### 3.3 Literature evaluation

The literature evaluation and the resulting literature search lists were refined in three phases to describe the actual state of the literature. This was also done to ensure a certain quality and reliability of the identified scientific investigations and to explicate the scientific assessment and rigor.

First, obviously misleading contributions with other than an organizational context of performance were left out. Examples were engineering contributions that aimed to raise any type of performance of systems or articles relating to product
proposals or application approaches. Remaining 200 contributions were picked out of the databases in two periods from January 2010 to November 2010 and January 2012 to June 2012. Aligned on the main research question why PMS do not fulfill their promises, the literature resulting from the search step was refined in the second phase. Papers that covered only portions or subareas of this scope were left out, e.g., papers on the introduction, application, or discussion of specific PMS, and those which covered particular geographical regions or distinct branches of industry. Particular emphasis on various aspects of performance measurement and management sometimes became visible or could be relativized after reviewing the content or at least the abstracts. Just a few articles related to the term performance management e.g., deal with personal performance development and assessment and hence were left out. In a third phase, the resulting list was included in backward search for citing articles. References from these remaining papers were also taken into consideration.

The evaluation focused on papers that at least discuss PMS as a phenomenon that is imperfect to some extent (in the subsequent text we refer to this group as the class of papers) or even better those that actually explicate and examine the determination, derivation, and description of disruptions, drawbacks, issues, roadblocks, or obstacles in order to collect reasons that prevent PMS from fulfilling their promises (referred to as critiques, a subset of papers).

This pruning procedure resulted in 116 relevant papers [1]-[39], [41]-[42], [44]-[55], [57]-[64], [66]-[88], [90]-[94], [97], [99]-[108] and [110]-[125] of which 22 can be classified as distinct critiques [9], [14], [21]-[24], [35]-[36], [38]-[39], [46]-[47], [53], [58], [60], [64], [76], [79], [91]-[93], [108], [118]. These critiques were the first entry point for analysis. The section closes with the comment that the search should be classified as selective. That is, the resulting compilation of literature of course cannot be considered as fully conclusive, but acceptably concise due to the rigor of the mechanisms used.

3.4 Literature analysis

The papers are examined and categorized in order to identify patterns and insights that are suitable to reply to the research questions and generate approaches for hypotheses. We used three well-established schemes to characterize contributions in the field of IS and PMS. First, the basic elements of any information and communication system (Human, Task and Technology as well as the areas of tension between them) are used to display the focus of the contribution. This basic structural definition of an information system can be considered as common knowledge, one exemplary source being the encyclopedia by Heinrich et al. [56]. Second, the Pettigrew et al. [96] framework was used, in which the focus of any investigation on organizational and strategic change can affect the context, content or the process of the change itself. Third, we use the categories of certain functions that PMS are supposed to fulfill according to Franco-Santos et al. [47]. They distinguish between Measuring performance, Strategy management, Communication, Influencing behavior and Learning and improvement. The categorizations were performed for the complete set of papers (n=116) and separately for the subset of critiques (which contained obstacles, n=102) for better comparability and pattern revelation. The following graphs 4-6 display their distribution.
The critique is analyzed by collecting and counting the explicitly named drawbacks. They are categorized into ten distinct classes of disruptions that prevent PMS from functioning properly. Table 1 explains them in detail.

<table>
<thead>
<tr>
<th>Disruption</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Personal adoption</td>
<td>The employee is unable or unwilling to personally adapt the PMS or to bear its impact</td>
<td>Fear of personal risk [79] or Resistance to measurement [60]</td>
</tr>
<tr>
<td>Management adaption</td>
<td>The manager or management level is unable or unwilling to implement the PMS or to bear its impact</td>
<td>Management commitment [22] or Distracting initiatives [91]</td>
</tr>
<tr>
<td>Cultural embedding</td>
<td>The organization culture and their paradigms do not support a fruitful implementation and use of PMS</td>
<td>Missing performance management culture [39] or Bureaucracy [76]</td>
</tr>
<tr>
<td>Execution</td>
<td>The PMS is not used in a way to identify, control and align the strategies of the organization and their drivers</td>
<td>Poor implementation of measures [79] or Lack of refinement and review loops [76]</td>
</tr>
<tr>
<td>Strategy relatedness</td>
<td>The PMS is not used in a way to identify, control and align the strategies of the organization and their drivers</td>
<td>Missing link to strategy [21] or Poor identification of drivers [14]</td>
</tr>
<tr>
<td>Measures application</td>
<td>The used measures are too many, poorly defined and maintained, hard to define or are lacking expressiveness</td>
<td>Too many measures [39] or Unwillingness to quantify qualitative issues [58]</td>
</tr>
<tr>
<td>Organizational alignment</td>
<td>The PMS does not supply fit in the organizational structure, workflow or initiatives</td>
<td>Process level is underrepresented [64] or Missing link to improvement initiatives [21]</td>
</tr>
<tr>
<td>Resources dependency</td>
<td>There are limits of other shared basic resources of an organization that prevent a PMS from being established</td>
<td>Time consuming [14] or Consumes financial resources [91]</td>
</tr>
<tr>
<td>IT integration</td>
<td>The PMS is not supported by an appropriate Information System or supplied with appropriate data</td>
<td>Lack of IT tools [36] or Data quality [9]</td>
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</table>

Table 1: Identified Disruptions of PMS

Though this categorization is a detailed description of the reasons for PMS malfunction, these 22 out of roughly 4500 contributions (≈4.4%) seemed to be too few to be a significant representation. This leads to a second step where we analyzed each discussed problem, focusing primarily on motivational trigger of the whole list of papers to gain framing and additional insights to the question of the people’s problems with PMS. Seven categories could be condensed from the list of individual problems and motivational backgrounds and are displayed in Table 2. They are:

<table>
<thead>
<tr>
<th>Motivation</th>
<th>Explanation</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application</td>
<td>The discussion of bad or improved application of given PMS in existing domains</td>
<td>Problem: To develop an causal business model describing how value drivers are linked to strategy Motivation: Insufficient model development by relying on generic measurement frameworks or “best practice” is unlikely to work [66]</td>
</tr>
<tr>
<td>Enhancement</td>
<td>The discussion of the primary purpose of a PMS as catalyst for overall performance enhancement</td>
<td>Problem: Description of a systematic overview of the main problems to be expected, and a more accurate failure rate of PMSs Motivation: The use of PMS improves the performance and overall quality of an organization [39]</td>
</tr>
<tr>
<td>Improvement</td>
<td>The discussion on changing the PMS scope and use in order to better catch e.g. effectiveness related, environmental, intangible or invisible issues</td>
<td>Problem: Insufficient usage of nonfinancial measures in companies Motivation: Missing visibility of the efficacy of governance and management processes [25]</td>
</tr>
<tr>
<td>Development</td>
<td>The discussion related to the incorporation of additional or other management methods into the PMS (e.g. change management, organizational learning, other managerial competences)</td>
<td>Problem: Independence of culture and Management Style with success and failure of PMS implementations Motivation: To find out how management style and culture and PMS interact in both ways [15]</td>
</tr>
<tr>
<td>Political</td>
<td>The discussion of a PMS being a vehicle to establish and change certain political business paradigms, e.g. accountability, productivity, competition or collaboration</td>
<td>Problem: The quest for meaningful measures Motivation: The desire to quantify remains [85]</td>
</tr>
<tr>
<td>Competition</td>
<td>The discussion of the principal need to adequately react on competition</td>
<td>Problem: Categorization of KPIs Motivation: Competitive pressures are forcing the industry to re-examine and improve its modus operandi [31]</td>
</tr>
<tr>
<td>Information</td>
<td>The discussion of PMS as catalyst or supplier of information to the stakeholders and the management</td>
<td>Problem: The exploitation of intangible assets has become more and more decisive for companies’ success Motivation: Competition in companies is based on information [60]</td>
</tr>
</tbody>
</table>

Table 2: Identified motivations of contributions on PMS
The overall distributions of both categorizations are depicted in Figures 7 and 8.

Figure 7: Motivations of papers

Figure 8: Disruptions of PMS

3.5 Interpretation

The interpretations of the results assume that the distribution of the categories within the evaluated set of contributions is uniform. In this case, the collected papers display the common sense in the field of research on PMS in comparison to the complete population of the topic. Four findings can be discussed. They remain relatively unspecific compared to the spectrum of motivations that underlie them. Moreover, they are likely to contain multiple disruptions that prevent PMS from working properly. So these identified specific categories have to be drilled down later based on the detailed collected motivations and disruptions.

F1. There is a discrepancy between the basic element of IS (Figures 4.1 and 4.2). The papers nearly exclusively contribute to the task topic, but the distinct critiques complain of issues located in the human area and its interplay with tasks in the first line.

F2. Both sets of contributions contain the same ranking list of the discussed strategic focus by emphasizing contextual before procedural and contentual problems (cf. Figure 5.1 and 5.2). This is in line with Finding 1 by articulating problems in the area between the used PMS and their application.

F3. The critiques put emphasis on the PMS purpose of influencing behavior, the paper’s categorization points to learning and improvement as the main issue to be addressed to improve PMS as a whole (Figures 6.1 and 6.2). These main points should be investigated in detail (see drilldown section).

F4. The critiques show a significant lack of discussion of the PMS purpose of communication (Figure 6.2). As communication should be the basis for people’s (human) understanding, the dependencies of this problem on its determining disruptions must be investigated in detail by drilling down. This finding also goes in line with Finding 1 and 2.

Based on these findings, the following five drilldowns were performed, using a cross tabulation of the disruptions and motivations and their driving categories of key elements, change foci and purposes:

D1. Disruptions, which drive to the key element human are personal adoption, management adoption and cultural embedding. The motivations that drive to it are improvement, information and political (F1).

D2. Disruptions, which drive to the change focus context are personal adaption and cultural embedding. The motivations that drive to it are improvement and information (F2).

D3. Disruptions, which drive to the purpose influencing behavior are personal adoption, management adoption and cultural embedding (F3).

D4. Disruptions, which drive the purpose communication are IT integration and information supply with a significant underrepresentation of information supply (F4).

D5. Motivations, which drive to the purpose learning and improvement are application, competition, development, enhancement and improvement with a significant underrepresentation of information (F3).

Derived from these basic findings and their drilldowns, the following four hypotheses can be formulated:

H1. The majority of contributions on modification of PMS tasks (systems in this case) are misleading to some extent, because there is an underlying problem of humans with the tasks which is still unsolved (F1).

H2. There are problems in understanding PMS’s purpose and results, as opposed to executing them (F2).

H3. There is a gap in the focused improvement of existing PMS (in the sense of adding up unmentioned or invisible aspects of performance measurement) aiming at
information supply and information quality in order to foster personal understanding, organizational adaption and finally the usability of the Information (D1-D3).

H4. Though the amount of contributions on communication issues, esp. information as motivational driver for PMS and missing information supply of PMS is increasing over time, there is not an appropriate and helpful discussion yet (D4-D5).

4. Results and conclusion

In the introductive section, we pointed out the hybrid characteristic of PMS in the context of KS. On the one hand, they are primarily used to measure the processes and results of a company or its designated information and knowledge systems, hence to act as an assessment tool for KS. On the other hand, they can be seen as actual repository for the knowledge-intensive business process of measuring and managing performance, highlighting their usability as KS themselves. The results of this contribution underline this information supply function of PMS. It embodies an empirical study on the use and misuse of this specific KS and emphasizes the need to improve the knowledge related side of performance measurement, not the measurement aspect of KS. This need can be derived from four hypotheses which result from the investigation of the identified 116 relevant papers on PMS, 22 of which could be identified as distinct critiques that explicitly deal with the reasons of failure (RQ1):

The discussion of the problems of PMS in the context of communication and information supply are still underrepresented (H4), despite an increasing interest which is reflected in increasing presence in the literature over time (RQ6). Three more hypotheses can be posed out of the investigation (RQ7): The problems with PMS applications are not primarily caused by imperfect systems, it's the people who have problems in using them (H1). In detail, they do not have problems with executing them, but rather in understanding their contextual embedding, like results and their implications, purpose or meaning (H2). If any PMS improvement has to be done, it should focus on the information supply and quality that fosters this personal understanding and adaption by the organization (H3). Discussing the other research questions that have been posed in the beginning, we can conclude that the obstacles contained in the critiques could be exploited and categorized, as well as the motivational background of the whole inventory of papers. This was being done by three well-established schemes (according to [47], [56] and [96]) that can be used for both sets of contributions and hence foster their comparability, thus serving RQ2. Two additional specific categories could be derived that better explain the information in the contributions, namely disruptions in case of the identified obstacles of PMS and motivations for the driving reasons behind the engagement with PMS at all. Hence, RQ3 and RQ4 can also be agreed upon. Based upon this information, four basic findings are formulated, which were refined by the application of five drilldowns of the identified categories (RQ5).

Summing up, these findings lead to the need to investigate in detail the mechanisms and theories that create, deliver, and process information in PMS, as they can be seen as information systems that contain valuable and exploitable knowledge, independent of the respective PMS in use. Future research on PMS and performance information will be based on this approach. These findings are also valuable for the management level which is responsible for the implementation, use or development of a PMS. As they are applied and their output is interpreted by humans, they should be enabled to interpret, adapt and understand its outcomes rather than to simply execute according to the figures that are delivered by the system. This could result in e.g. in an increase of internal communication, the use of knowledge databases and training on the purpose and implications of the system and its measures and strategies. Further research on PMS, especially on the (re-) design and usage of PMS, should consider these findings to support the requirements of the people working with these valuable, indispensable, sometimes unavoidable information systems.

5. References


