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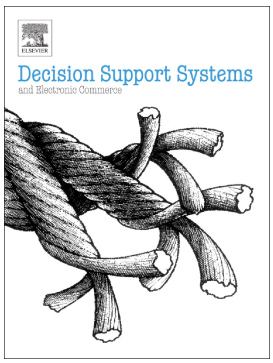

Business intelligence for performance measurement: A case based analysis

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Business Intelligence for Performance Measurement: A Case Based Analysis

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ABSTRACT

The adoption of IT-based performance measurement systems (PMS) has increased in recent times. The proliferation of business intelligence (BI) has significantly impacted performance measurement in organizations. In this paper a novel process-based framework is proposed to enable end-to-end analysis of technology driven PMS implementation in an organization. The framework has been used to study PMS implementation in a large manufacturing firm in India. The analysis of the case provides key lessons about successful planning, execution and adoption of a BI based PMS as well as identification of critical success factors (CSF) in the implementation of PMS, that would be of interest to organizations planning to implement a similar system.

KEYWORDS

Business intelligence; Case study; Critical success factors; Framework; Key Performance Indicators; Manufacturing firm; Performance measurement systems.

1. INTRODUCTION

Measuring organizational performance, and using the information to drive organizational policy and functioning is at the core of management (Neely & Al Najjar, 2006). A well-designed system for measuring performance enables an organization to translate its strategy to operational goals (Neely, Gregory, & Platts, 2005; Grosswiele, Röglinger, & Friedl, 2013), and drive the behavior of employees to achieve the goals (Neely, Gregory, & Platts, 1995). Also, it enables a better management of resources by promoting transparency (Halachmi, 2002).

The history of performance measurement can be traced back to the era of industrial revolution when it was used to monitor and manage performance of shop floor workers (Radnor & Barnes, 2007). Until 1970s, performance reports were largely paper-based. With the advent of IT, paper-based reports were replaced by decision support systems (DSS). DSS allowed faster and timely access to information, and allowed managers to observe interesting trends and patterns in data with ease. The next level of evolution was the development of executive information systems (EIS), which unlike DSS were specifically designed to address the decision needs of senior management (Watson & Frolick, 1993). The major component of EIS was an electronic dashboard, which displayed information relevant to senior executives. The dashboard allowed senior managers to view, synthesize and relate a

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large amount of information, not possible with standalone DSS. EIS remained a popular tool for performance measurement till late 1990s. With the growing amount of data, often in silos, it became necessary to integrate data from various sources to provide a 'single version of truth'. Furthermore, a faster access to data and use of advanced analytical tools became important (Frolick & Ariyachandra, 2006). This led to the adoption of business intelligence (BI) systems to support performance measurement.

With increase in competition and complexity of environment, and rapid technological development, the adoption of IT-based performance measurement systems (PMS) has spiked in recent years. This is evident from the increased spending on BI systems (which are primarily used for performance measurement activities), with the market for BI expected to reach more than US$ 50 billion by 2018 (ITEuropa, 2014). Implementation of a PMS is accompanied by unique managerial problems, solutions to which may help enhance the benefits obtained from the system. This paper focuses on two important questions: a) *how should a firm implement a new PMS?* and b) *how do we qualitatively ascertain the critical success factors (CSF) for the implementation of a PMS?*

2. LITERATURE REVIEW

Drawing from the literature in Information Systems and Operations Management, we can classify the extant literature on PMS implementation into three categories. Appendix A lists the papers in the form of three tables A1 – A3. The first category of research papers (as shown in Table A1) discuss the implementation of new performance measurement metrics, and corresponding organizational changes, with little or no focus on IT. The major gap in this stream of research is the minimal focus on IT during implementation of a PMS, despite a PMS being an IS (Marchand & Raymond, 2008). Both technological aspects of PMS and organizational issues related to technology have been overlooked in this line of work. The second category of research papers (shown in Table A2) focuses on the role of technology in implementation of a PMS. This stream of research, while studying the role and impact of technology infrastructure and specific applications, has largely ignored issues associated with interaction of technology with performance measurement procedures and the corresponding impact on employees. Also, the non-technological aspects of a PMS (e.g., goal setting) have been overlooked. The third category of research papers (as shown in Table A3) focuses on organizational challenges associated with different stages of implementation of an IT-based PMS and possible ways to mitigate the same. The papers in this stream of research, while attempting to address the gaps of the other two streams, have focused exclusively on specific aspects (e.g., top management support) or stages (e.g., evaluation of a PMS) of implementation. However, the implementation

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of PMS is a single project with steps taken at different stages often affecting outcomes during subsequent stages of implementation, which has been ignored in this stream of work. To enable a comprehensive analysis and understanding of PMS implementation, there is a need for an integrated framework, covering process (e.g., development of performance measures), people (e.g., user acceptance) and technology (e.g., use of dashboards) aspects, with a holistic focus on the entire project and not just on individual aspects or stages of the project. Besides these, a review of literature reveals another important limitation. There is no study related to PMS implementation, which has findings relevant to core IS literature. Since a PMS is essentially enabled by use of IT (BI), studies on performance measurement can unearth contextual findings, relevant and novel to IS literature.

To bridge the gaps, a novel theoretically grounded framework has been proposed to explain implementation of an IT-based PMS, covering all stages of implementation and with a focus on organizational changes and corresponding impact on employees, in addition to technology. To enable a fine-grained analysis of implementation that is necessary to detect and study organizational changes and their impact, a process view has been employed and performance measurement has been conceptualized as an array of processes. The framework has been validated by the case study of a large manufacturing firm in India. The usability of the proposed framework has been illustrated by employing it to study and contribute to literature on CSF in BI implementation. The details of the framework have been presented in the following section.

3. RESEARCH FRAMEWORK

IT implementation framework

Kwon & Zmud (1987) have proposed an IT implementation framework based on Lewin's organizational change model (Lewin, 1952). This is refined by Zmud & Apple (cited in Cooper & Zmud, 1990), and an updated framework is proposed with six major stages of implementation: *initiation, adoption, adaptation, acceptance, routinization,* and *infusion,* as discussed below.

Initiation - During the initiation stage of IT implementation, an analysis of the existing organizational activities and IT solutions available in the market is done. The purpose of this stage is to discover activities that can be made more efficient or effective, which in turn may generate greater value for the organization. While it is generally initiated in response to an existing crisis, the availability of new technologies in the market may also trigger the process.

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Adoption - In this stage a discussion among various stakeholders associated with the new IT solution takes place. Beside a rational analysis of the various costs and benefits associated with the system, a discussion of the organizational and political implications of the system is also undertaken. This stage culminates in a decision to adopt (or reject) the IT solution.

Adaptation - The adopted solution may either be purchased from the market or developed internally. The implementation of the solution may require changes to various organizational processes and existing technical infrastructure and in some cases even to the organizational structure. By the end of this stage, the IT solution is made available for use by intended users.

Acceptance - During this stage, the firm puts in effort to ensure that the solution is accepted and used by the intended users. It typically involves training of users to ensure that they have the technical know-how to use the new system. By the end of this stage, the IT solution is put in use to support intended activities.

Routinization - While the purpose of the *acceptance* stage is to ensure that end-users start using the IT solution, during the *routinization* stage efforts are made to ensure that the IT solution is perceived as a normal part of organizational work and no additional cognitive effort is expended by users in using the system. Furthermore, it is ensured that discontent among the employees regarding the IT solution, and resulting resistance is addressed.

Infusion - In this stage the benefits of the IT solution are realized, in terms of increased effectiveness or efficiency of organizational activities, leading to a greater value for the organization. The impact is measured both at the point of implementation (e.g., faster access to information) as well as at a more strategic level (e.g., increased profits, customer satisfaction etc.)

Performance measurement process framework

Based on a comprehensive survey of extant literature, Franco-Santos et al. (2007) identified individual processes constituting performance measurement and grouped them into five categories, as listed below.

Selection and design of measures - The individual processes which fall within this category include: identification of needs and wants of individual stakeholders (to enable performance measurement and management directed towards fulfillment of those needs), planning at the strategic and operational level, specification of strategic objectives (which can be cascaded to define objectives at lower levels), actual design of measures (to achieve specified and derived objectives at various levels), and selection of measures and setting of targets against each of the measures for individuals and teams at various levels.

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Collection and manipulation of data - This stage consists of two processes. They are collection of data from various internal and external sources, including but not limited to the enterprise data warehouse, managerial and peer feedback and market research data, and analysis of data to calculate the values of metrics that can be used for measuring performance.

Information management - This category of processes is directed towards effective management and use of information derived from data. It includes provisioning of information (to the right person, at the right time and in right format), interpretation of information and decision making by the stakeholder.

Performance evaluation and rewards - This stage consists of two processes. They are evaluation of performance and linking of performance to rewards. These processes allow a PMS to be used for driving employee and group behavior in an organization.

System review - It consists of the process for review of the PMS to be updated with the changing environment and goals of the organization.

Unique characteristics of PMS and additional theoretical support for the framework

While a PMS is an information system, the scale of its impact on organization is much larger than any typical system in use. A change in PMS is generally associated with large-scale changes, sometimes affecting the entire workforce. This mandates specific requirements for a PMS that need to be factored in during implementation. First, a PMS needs to balance conflicting interests of several diverse groups of employees. A new PMS inadvertently causes a change in balance of power in the organization, leading to resentment and resistance from employees at various levels. It is important to recognize and prepare for the same. Second, because of its scale, huge costs are involved in updating technological infrastructure and carrying out organizational changes for a PMS. Any error in implementation may result in severe decline in performance of firm. This makes adoption of PMS a risky decision. And third, expected outcomes of a PMS are generally linked to employee behavior, and an observable effect on goals and objectives may be visible only a long time after implementation.

PMS implementation framework (PMSIF)

The proposed framework for implementation of a PMS (PMSIF) is developed by combining the IT implementation framework and performance measurement process framework, discussed above. Specifically, individual stages of IT implementation framework, as proposed by Zmud & Apple, are adapted to the performance measurement context, and the process view is incorporated, based on performance measurement process

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framework (Franco-Santos et al., 2007). As shown in Figure 1, the PMSIF consists of six stages. The third to fifth stages have been shown enclosed and a process view has been proposed to analyze and understand these stages. For the remaining stages, the process view analysis is not relevant. Individual stages of the PMSIF are discussed below.

Initiation - The initiation of a new PMS is generally triggered by declining performance of the organization. A new PMS leads to major organizational changes (Bourne et al., 2002), and is often resisted by various sections of employees (Bourne et al., 2000). Thus, it needs not only substantial financial investment but also a firm commitment from senior management (Bourne et al., 2002). Furthermore, it is inherently risky, and a failure in implementation may lead to a crisis (Bourne, 2005; Bourne, Neely, Mills, & Platts, 2003). It is more likely that the introduction of a new PMS is a result of a 'push' borne out of unsatisfactory performance, rather than a 'pull' triggered by availability of advanced technology.

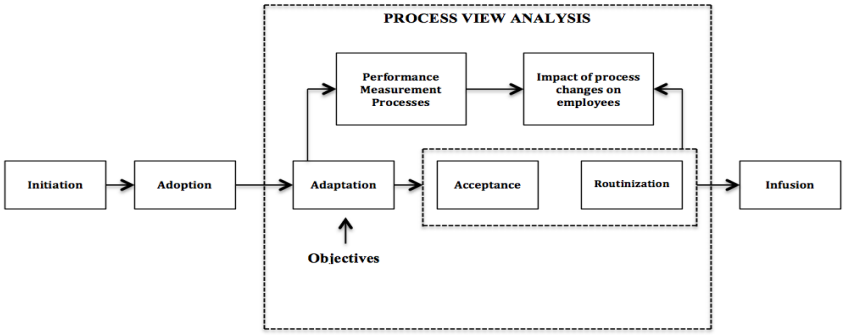

Figure 1. PMSIF: A framework for implementation of a PMS in an organization.

Adoption - In this stage, decision to implement (or reject) a new PMS is taken. A cost-benefit analysis plays an important role in the decision. The costs incurred are due to change of processes and training of employees to use the system rather than the cost of procurement of the technology. A change in PMS may lead to a shift in power balance (Bourne et al., 2000), and have major political implications. Therefore, besides cost-benefit analysis, political issues may impact the decision to adopt such a system.

Adaptation - In the context of performance measurement, the *adaptation* stage involves deployment of technological infrastructure and systems and making changes to existing performance measurement activities, to achieve the objectives of implementation, as finalized during *adoption* stage. A process view analysis may be employed to understand the activities taken up during this stage. Specifically, performance measurement

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processes, which need to be changed to achieve the objectives of implementation, have to be identified. We propose that activities taken up during this stage will be directed towards enabling the identified process changes.

Acceptance and routinization - In the context of a PMS, it is difficult to differentiate between the acceptance and routinization stages of implementation and acceptance stage may be considered as the first step of routinization. Specifically, the acceptance of a PMS may be considered the beginning of a particular performance cycle in an organization during which the new PMS is used for the first time for appraising performance. The routinization stage, on the other hand, spans several performance cycles, during which the behavior of the employees changes in accordance with the new PMS, and the managers become accustomed to the new system for making decisions.

The process view, as proposed for analyzing the *adaptation* stage of implementing a PMS, can be extended to the *acceptance* and *routinization* stages. Specifically, we suggest that each of the changes made to the performance measurement processes be analyzed from the 'frames of reference' of individual employee groups, and the impact of changes on these groups be observed. Since the resistance from the employees emerges out of the negative impact of the changes, we propose that the actions taken during the acceptance and routinization stages will be directed towards mitigating the impact.

Infusion - During this stage the organization starts reaping the benefits of the new PMS as a result of change in the behavior of the employees, and better managerial control enabled by the PMS. As the scope of a PMS is large (generally it impacts the entire organization), this stage involves assessing and delineating the impact of the new PMS at various levels, and taking corrective actions, wherever necessary.

Determination of CSF for implementation of PMS

Building on our proposed framework for PMS implementation, we propose a simple three-step approach to draw insights relevant from the core IS literature for determination of the CSF in implementation of PMS. The approach has been designed for exploratory studies. With minor modifications this may be useful in explanatory studies as well. The approach has been presented below.

Step 1: We identify the different variable(s) of interest that play a pivotal role at the different stages of PMS implementation as indicated in the PMSIF.

Step 2: Since a PMS is enabled by the use of IT, implementation of a PMS may be considered equivalent to IT implementation in a performance measurement context. Therefore, the phenomenon observed is a special case of

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IT implementation. The IS literature is reviewed to determine the CSF that are indicated as influential in extant research on IT implementation.

Step 3: The findings of steps 1 and 2 are compared to identify the CSF for PMS implementation that can be identified from literature on IT implementation and also those that are unique to implementation of PMS. This step may lead to discovery of CSF that have not been identified in past research on IT implementation.

4. METHOD

To validate the proposed framework a case study based approach was employed. Case study has been suggested as an appropriate research method when there is a rich interaction of context with phenomenon, and therefore, contextual factors need to be considered for studying the phenomenon (Yin, 2014). The role of contextual factors is important in implementation of a PMS (Lapointe & Rivard, 2005). Also, the phenomenon is complex with several factors affecting PMS implementation at various stages. Therefore, the case study method was considered suitable for this study. Being well-accepted and largely used, several papers in IS discipline have provided guidelines covering different aspects of case research. For the purpose of this study, Pare (2004) was followed, as it provided a comprehensive end-to-end roadmap and recommendations for conducting the case-based research. A detailed description of the method used in this study is presented below.

As the first step, research questions to be addressed were defined and agreed to by the co-authors. Two questions were finalized: a) *What are the different steps involved in the implementation of a PMS?* and b) *How do we qualitatively ascertain the critical success factors for the implementation of a PMS*? After this, appropriate firm(s) were searched for and identified. Since the purpose of employing the case method in our study is to validate a framework grounded in theory, therefore a purposive sampling approach was used (Yin, 2014). The sample selection was not random, but was driven by a specific ‘purpose.' A set of firms which recently implemented a new PMS were identified. Further filtering was done based on the following criteria: a) Firms which had implemented large-scale, organization wide changes to PMS were considered. Firms where only minor changes had been made to the system were filtered out. b) Firms where changes to PMS were enabled by the use of BI were only considered. c) Firms where implementation of PMS was done in-house and not driven by an external vendor were only considered. With the involvement of third party vendor, implementation becomes more complex, as the objectives of the vendor need to be brought in line with the overall objectives of the firm. One firm, which satisfied these criteria was identified for validating the framework. After this, data regarding

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implementation of the PMS was collected through interviews, questionnaires and implementation related documents obtained from the firm. The process of data collection spanned several stages. First, one of the authors of the paper administered a semi-structured questionnaire that was aimed at getting initial details related to various aspects of the project. The questionnaire was administered to members of the IT department to understand the ground level details of the project. This was followed by interviews with the head of the IT department and various other stakeholders of the project, details of which have been presented in Table 1. The questions during these interviews were directed and informed by data collected from the IT department during the previous round. Data collected till this point was organized in a database, analyzed from the lens of the proposed framework, and gaps in the data were noted. The pattern matching approach was employed for comparing the proposed framework with empirical findings of the case (Trochim, 1989). Pattern matching is a popular approach for testing theories using case studies. It involves comparison of patterns observed in a case with those predicted by a theory being tested. If the patterns are found to be similar, the proposed theory is upheld. The approach is frequently adopted in qualitative research and helps establish research rigor. To fill the gaps, another round of interview of relevant actors was conducted. The iterative process of data collection and analysis continued till one or both of the following two conditions were met: a) both authors were satisfied that data obtained was sufficient to validate the framework, and b) minimal knowledge was obtained with further collection and analysis of data.

Several measures were employed to ensure research rigor and reliability of findings. First, findings from different data sources were compared for consistency. Whenever the findings were inconsistent, further inquiry was done to understand and discover the cause. Likewise, the analysis of data was carried out by both authors simultaneously and the findings were compared. Only when both authors agreed on the findings, they were reported as results from the study. Also, an initial version of manuscript was shared with management of the firm and confirmation and inputs were sought regarding the proposed framework and the interpretation of case findings using the lens of the framework. The manuscript was reviewed by the head of the IT department of RCL. He expressed satisfaction with the proposed framework and the interpretation of case. These steps helped eliminate errors and ensured reliability of the findings.

Role	**Number of interviews**	**Total duration (Mins)**
CEO	1	60
Assistant Vice President, IT	4	330

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IT Department Staff	2	150
Manager 1, Marketing	1	60
Manager 2, Marketing	1	60
Sales staff	2	180
Customer of RCL	1	60

Table 1: Details of interviews conducted.

5. THE CASE OF RAMCO CEMENTS LIMITED (RCL)

Ramco Cements Limited (RCL) is established in the year 1961. It is the flagship firm of the Ramco group, which is a well-known business group of India having presence in industries such as textiles, software, and surgical cotton, besides cement. RCL is headquartered at Chennai, India and primarily produces 'Portland cement'. RCL has a reputation for being a technologically savvy firm and is often at the forefront in using new technologies. A recent IT initiative taken up by RCL was the *Big Data* initiative, which began in 2011 and had three major components: *Ramco PerfMon, Ramco GeoApps, and Ramco APO*. The purpose of the *PerfMon* project was to introduce advanced IT systems to enhance the effectiveness of performance measurement at RCL. The *GeoApps* project was initiated to capture the geographical location of all customers, cement plants and other assets such as wind farms and link the data to other information in the ERP system. The *Ramco APO* was primarily designed for optimization of outbound dispatches in real time. In this section, the *PerfMon* project is discussed in detail. Also, a brief discussion of how the *GeoApps* project complemented the *PerfMon* project is presented.

Existing PMS at RCL

For performance measurement at RCL, every function was divided into KPI Super Units, each of which in turn was divided into KPI Units. Each KPI Unit had a certain number of employees, who were evaluated on the basis of similar KPIs. For the purpose of goal setting, a cascading approach was followed. First, the board of directors decided firm level goals. Based on them, goals for individual functions were derived. Within a function, every manager starting from the head of the function was assigned the responsibility of designing the performance schema of the subordinates. The performance schema consisted of various KPIs and the weights assigned to the KPIs. This allowed managers to fulfill their own performance schema requirements by delegating tasks to their subordinates. The process ensured that the goals of the individuals were aligned with those of the function.

Problems with the existing PMS

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The KPIs for evaluating an employee were decided solely by the reporting manager, generally in consultation with the employee. Consequently, only the employee and the manager knew the definition of these KPIs and the formulae used for calculating them. This led to a situation where KPIs with same names but different definitions were used across teams and units. When the KPIs were discussed in review meetings, a large amount of time was spent on understanding and debating the definition of KPIs and little productive discussion took place. Another major flaw with the existing system was that the data used for calculating KPIs did not always come from reliable sources. In addition, managers found it cumbersome to read and understand the performance reports of employees that were delivered in spreadsheets and had little visualization support. These problems made it difficult to review performance and take corrective actions. To address these issues, RCL decided to update the existing PMS and a project called *PerfMon* was initiated.

PerfMon

As the first step, a cross-functional team was created to oversee the project. The team consisted of domain experts as well as members from support functions. The overall responsibility of executing the project was given to the IT department. Six primary objectives were decided for the *PerfMon* project: enhance the effectiveness of the goal setting process by increasing the clarity of the stated goals, enhance the transparency and objectivity of the performance measurement processes, increase the accuracy and hence the reliability of information used for decisions related to performance management, provide real-time online information to enable constant monitoring of performance, increase the employees' trust on the PMS and increase the acceptance of decisions based on the performance metrics, and improve the productivity of review meetings and discussions by ensuring that more time was spent on discussing solutions rather than on data related issues.

The new PMS covered employees at all levels at RCL. The interface to the PMS varied depending on the requirements of the employees. To understand specific requirements and expectations of employees from the PMS, the project team held discussions with employees at different levels. Besides providing a nuanced understanding of user requirements, this exercise also helped the project team identify the concerns of employees. At this stage, several managers were also identified who were convinced about the significance of the new PMS. These managers provided further inputs and helped the project team understand the users' perspective.

An important finding that emerged from the discussion was that there was a self-selection of the system by the employees. Most of the employees welcomed the increased transparency brought in by the new system. They

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believed that greater transparency would bring in more fairness and lead to higher employee satisfaction and productivity. Some concerns such as low flexibility and technical complexity of using the system surfaced. A smaller set of employees felt threatened and tended to resist the system. This group consisted of those employees who had been manipulating the existing PMS. They felt that increased transparency of system hurt their interests.

Standardization of KPIs

One of the primary drawbacks of the current PMS was the lack of a standard set of KPIs. To address this issue a repository of pre-defined KPIs, called the *Organizational KPI library* was created. It was decided that only those KPIs that were present in the library would be used for performance measurement. A two-stage process was followed for the creation of the library. In the first stage, an initial large pool of KPIs was identified. The following sources were used to identify those KPIs: top management guidelines for the function, KPIs currently used to measure the performance of the employees in the function and drawn from performance appraisal records, an Internet-based survey of various KPI libraries, output of various performance appraisal training programs and workshops, suggestions from department heads, small group decision-making sessions such as brainstorming sessions among project team members, industry norms and practices. In the next stage, KPIs were screened. Filtering was done based on six parameters: relevance (suitability of the KPI for the business model of RCL), independence (ensuring that two KPIs did not measure the same element), clarity and simplicity (unambiguous definitions of KPIs), quantifiability (measurable using simple mathematical formulae), validity (appropriate and acceptable for measuring the underlying element, and reliability (based on data from the ERP only).

Technology

To support the new PMS, RCL used a state-of-the-art BI system. From a functionality perspective, the BI system used by RCL had three major components: *analytics engine, dashboard* and *Google Map interface.* Analytics engine was the backend component of the PMS, and contained performance related information of the employees (e.g., KPIs, targets, historical information, etc.). All information provided to users was stored in the analytics engine. Dashboards were the front-end interface to the PMS. They allowed managers to define the performance schema of the reporting employees and allowed viewing and comparison of the performance of reporting employees on a real-time basis. Figure 2 showcases a dashboard where an employee's performance corresponding to various KPIs is depicted. Also, the overall performance score and a comparison with peers has is presented. To use the geographical information captured as a part of the *GeoApps* project for performance measurement, a

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Google Map interface was developed and integrated with the dashboard. The interface allowed managers to compare the performance of the sales staff and teams across geographies. Figure 3 illustrates a use of the Google Map interface and shows the locational information of both salespeople and customers. The map is useful for decisions regarding allocation of salespeople across locations. Detailed information about individual salespeople and customers is available to the decision maker by clicking on pointers representing them on the screen.

Several versions of the new PMS were released before the system was finalized. The employees were requested to test and suggest improvements to the system. The IT department employees were asked to be receptive about the concerns expressed by the users. Mr. Varadarajan, Assistant Vice President IT at RCL explained,

"An important principle, which we followed throughout the implementation, was to be empathetic towards the needs of the users. An IT system adds value only as long as it is used."

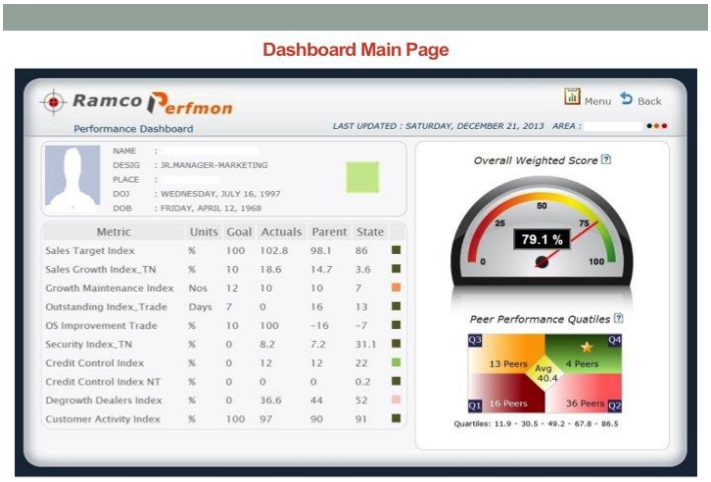

Figure 2: Performance measurement dashboard at RCL.

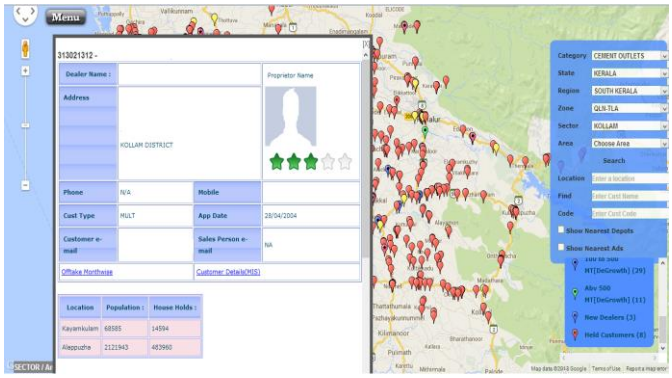

Figure 3: Use of Google Map interface in PMS.

Post implementation measures

Once the new PMS was put in place, RCL took several measures to ensure the effective usage of the system by the employees. First, a series of training programs were conducted. Through these programs, employees were made aware of the functionalities and benefits of the new PMS. Furthermore, the concerns of various users (which were understood during the user requirements gathering stage) were addressed. For instance, the primary concern of the sales staff with the new PMS was greater accountability and reduced flexibility. It was discussed during the training programs that a greater accountability was needed to bring more transparency in the objective performance evaluation of the sales staff on the basis of the reported KPIs. The managers, who were supportive of the new PMS, and had been identified at the beginning of the project, were requested to act as 'project champions'

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and convey the significance of the new PMS to others in the firm. Second, a report called the *BI utilization report* was generated. This report contained information about the number of hits on the dashboard made by employees. The report was circulated to the project team and the reporting managers of the employees. Whenever the number of hits fell below a threshold, the user was alerted. Also, the IT department got in touch with the user to resolve any difficulty the user faced in using the system. And third, in all review meetings, it became mandatory to use the BI-based PMS for reviewing performance. The use of spreadsheets and powerpoint presentations was prohibited.

Impact

Changes made to the PMS proved effective. Mr. Varadarajan, Assistant Vice President IT at RCL explained:

"The new system has increased effectiveness as the employees can now monitor their own or their subordinate's performance using dashboards. Also, performance comparison has become easier. There is a better perception regarding overall transparency of performance goal setting."

There was a major improvement in the productivity of review meetings, which was an important objective of introducing the new PMS, as implied by the following quote from a senior manager at RCL.

"The new system is quite useful in review meetings that I conduct. The reviews have become more objective, less time consuming, focussed and more than anything leads to acceptable action plans by the people concerned."

In addition, the rich visualization features embedded in the dashboard made the analysis of information as well as the communication between the employees easier. During an interview, a regional marketing head commented:

"As a busy sales manager, previously I took nearly two hours to analyze the data and used different tools like mail to communicate to my field sales people. Now, with the new system, it takes just half an hour to complete the analysis. Moreover, I can communicate significant points and visual screenshots to my people, query them on deviations and track their responses and actions all through the system itself. Time thus saved, I am utilizing now to meet my customers and resolve their issues better."

Mr. A.V. Dharmakrishnan, CEO of RCL emphasized the impact of visualization on managerial decisions.

"The previous system was based on tables of data with so many rows and columns that it was cumbersome to make decisions. On the other hand, data visualization is quite valuable as it forces us to notice what we never see otherwise. When it comes to communicating large sets of information, they present a much more efficient way to tell an insight, instead of telling about numbers themselves. It is the natural way our brain works!"

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Beside a better managerial control, the new PMS helped RCL ensure customer delight. The following quote from an important customer of RCL highlighted the impact that the new PMS had generated on customer satisfaction.

"In the past, whenever senior management from Ramco interacted with us, it would be more on relationship marketing and on general business issues. But now, such interactions are very focused on performance with visual information through charts, maps etc. in addition to the traditional relationship marketing. This helps me to grasp issues easily and move on."

6. DISCUSSION AND ANALYSIS

The RCL case is a good example of a successful PMS implementation. In this section, an analysis of the case is presented using the lens of the proposed framework. The analysis has a two-fold objective: first, to verify the validity of the framework, and second to observe and unearth interesting insights from the case study and thereby demonstrate the applicability of the framework in a real-life context.

Initiation - The proposed framework (PMSIF) suggests that implementation of IT in a firm is generally a response to an organizational problem or crisis. In the case of RCL, increasing competition was a major trigger that initiated the implementation of the new PMS. Specifically, it was realized that a focus on sales and distribution was needed to differentiate the firm from competition and for that the role of employees was critical. This led RCL to initiate implementation of an effective system to measure and manage employees' performance.

Adoption - The framework suggests that during this stage a discussion among various stakeholders is held regarding whether or not the firm should implement the new PMS. There was little dichotomy at RCL regarding the potential benefits of a robust system for measuring performance. The top management realized that absence of an effective system for measuring performance was affecting managerial decision making, leading to lower sales and even lower competitiveness. In addition, it was having an adverse impact on employees' morale. The potential benefits outweighed the costs associated with the implementation of the new PMS. The political issues, on the other hand, had little impact on the decision to adopt a new PMS because of top management's commitment.

Adaptation - This was the most complex stage of PMS implementation at RCL. Consistent with proposed framework, this stage primarily consisted of three activities. First, existing technological infrastructure was upgraded. Employees were directed to use the new system, and training programs were conducted to ensure that employees used the system. Second, KPIs used for measuring performance were standardized and placed in a central repository called the KPI library. Top management made it mandatory to use the KPIs only from the

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repository. Third, several policy measures were introduced to sustain the changes. Specifically, only data from the ERP system were used for performance evaluation and manual entry of data for the purpose of performance measurement was prohibited. Similarly, managers' discretionary powers in performance evaluation were reduced. Managers were expected to finalize measures for evaluating performance and corresponding targets against the measures for all employees reporting to them at the beginning of the performance cycle. Performance evaluation was done automatically by the system based on the measures and data from the ERP.

The PMSIF suggests that activities taken up during this stage of PMS implementation are directed towards bringing changes in existing performance measurement processes to achieve the objectives of implementation. Following this, first, an analysis of changes needed and changes made to the existing performance measurement processes at RCL to achieve the project objectives is done. The analysis is presented in Table 2.

Objectives	**Changes needed to achieve the objective**	**Performance measurement processes that needed to be changed**
To enhance the effectiveness of the goal setting process by increasing the clarity of the stated goals.	Objectively defining the goals and targets at the individual and the group level as well as clearly specifying roles for individuals and groups.	Design of measures (definition of measures became more objective), selection of measures, and target setting.
To enhance the transparency and objectivity of the performance measurement processes.	Aligning performance evaluation with objectively defined goals and targets, and reducing the discretion of managers in performance evaluation.	Performance evaluation [The process changes for achieving goal clarity needed to be implemented. This is because goal clarity is a pre-requisite for enhancing transparency and objectivity of a PMS].
To increase the accuracy and reliability of information used for decisions related to performance management.	Eliminating all unreliable sources of data in performance measurement activities.	Data capture, selection of measures (only those measures should be used for which reliable data is available), and information provision.

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To provide real-time online information to enable constant monitoring of performance.	Deploying appropriate technologies to support real-time information provision.	None.
To increase employees' trust on the PMS and increase the acceptance of decisions based on performance metrics.	Corollary of objectives 2 and 3.	Performance evaluation, data capture, and process changes for achieving clarity of goals.
To improve the productivity of review meetings and discussions by allowing discussion of solutions rather than data related issues.	Standardizing the measures.	Designing of measures.

Table 2: Project objectives and corresponding process changes instituted by RCL.

It may be observed from Table 2 that to fulfill project objectives, changes were needed for six performance measurement processes: design of measures, selection of measures and target setting, performance evaluation, information provision, interpretation and decision making, and data capture. The table also lists the activities taken up to enable each of these. Changes in the data capture process were achieved largely by a technological exercise, and partly by a new organizational policy wherein the PMS was linked to the ERP system, and only data from the ERP system was allowed for performance measurement. Likewise, changes to information provision were largely achieved using technological means, primarily by installing dashboards with advanced features for presenting complex information to managers. To ensure that managers could effectively interpret information provided by dashboards, and thereby improve the quality of decisions (*interpretation and decision making*), training programs and workshops were conducted, where the technical know-how of using the system was imparted and the importance of data-driven decision making was discussed. The changes to the process of design of measures were brought about by developing a standard set of measures, and making it mandatory to use those measures, from within the pre-defined set for performance measurement. The changes to the remaining two processes, *selection of measures and target setting*, and *performance evaluation* were brought about by a combination of policy and technology. The process of selection of measures and setting targets was standardized and made more transparent

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by making it mandatory to use the KPIs from the pre-defined organizational library, and making it compulsory for all managers to define and freeze the performance measures and targets to be achieved against each of the measures for all employees reporting to them at the beginning of the performance cycle. Similarly, performance evaluation was made more transparent and fair by ensuring that the performance on the KPIs, compared against the initial targets, were used for appraisal.

Acceptance and routinization - RCL employed several measures to ensure acceptance of the system and mitigate resistance by the employees, which may be broadly categorized under two heads: *measures to encourage voluntary acceptance,* and *coercive measures for acceptance.* The voluntary measures involved discussions with various groups of employees at different stages of implementation and this generated a sense of participation among the employees. Similarly, several training programs and workshops were conducted where the technical details of using the system were discussed and employees were made aware of the importance of data-driven decision-making. The coercive measures included making the system mandatory for performance review meetings and tracking the use of the system by the individual employees and reaching out to them, in case the usage of the system was found to be low.

Similar to the *adaptation* stage, the PMSIF suggests a process view analysis to understand this stage of implementation. Specifically, the framework suggests that the changes made to the performance measurement processes may have a negative impact on various sections of employees, which may lead to resistance from the employees. The steps taken during these stages should be viewed as an attempt to mitigate the negative impact of any of the process changes. Following this, an analysis of the impact of changes made to the performance measurement processes, on individual sections of employees is done. The analysis is presented in Table 3.

Process	**Description of change**	**Impacted stakeholders**	**Description of impact on stakeholders**
Measures design and selection.	A KPI library was created, and measures were selected only from the library.	Sales staff and managers.	Lesser discretion for managers in selecting measures to be used for performance measurement, clearly defined goals for both managers and salespeople.
Target setting.	Targets had to be decided at the beginning of the performance	Sales staff and	No flexibility for managers and sales staff to update the target midway through the

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	cycle.	managers.	performance cycle.
Data capture.	Only data that was present in the ERP system could be used for performance measurement.	IT department, salespeople and managers.	Additional maintenance work for IT staff (to ensure smooth running of the ERP system). Managers and salespeople could not use data from sources other than the ERP system for performance measurement.
Information provision.	A new interactive dashboard was developed to facilitate performance monitoring.	Managers.	A novel state-of-the-art interactive dashboard allowed managers to monitor performance.
Decision making.	Decisions taken by managers needed to be backed by data.	Managers.	Managers discouraged from taking decisions not backed by data.
Information provision and rewards.	Performance evaluation had to be based on employees' performance against the targets decided at the beginning of the business cycle.	Sales staff and managers.	Lesser discretion for managers in evaluating performance and greater transparency in the system. This motivated the salespeople to focus on performance rather than to improve their relationship with managers.

Table 3: Stakeholders impacted by various process changes at RCL.

It may be observed from Table 3 that primarily three sections of employees were impacted by changes proposed to the performance measurement processes: *sales staff, managers,* and *IT department staff.* The IT department was expected to enable the various process changes, including changes to how the data used for performance measurement was collected / captured and how the information was made available to the users. The IT department was also responsible for training the users and periodically reviewing the system. The sales staff and managers were impacted by changes proposed to the processes of selection of measures, setting of targets and performance evaluation. Specifically, the managers lost the flexibility to evaluate the performance of their subordinates. In the new PMS, the measures used for performance evaluation and targets assigned to the employees had to be decided at the beginning of the performance evaluation cycle. Also, the measures had to be selected from a pre-defined set (KPI library). Since the measures in the KPI library were easily quantifiable, the performance of employees at the end of a performance cycle could be compared against the proposed targets,

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making performance evaluation more transparent. In the new system, therefore, there was lesser discretion for managers for evaluating the performance of their subordinates. There was an indirect impact on sales staff, as they had little opportunity to influence their managers to manipulate the performance output. Besides, the sales staff and managers were expected to learn the operation of the new PMS, which was significantly different from the existing system. Finally, the sales staff and managers also faced uncertainty regarding the new system and its potential impact on their performance evaluation and hence growth within the firm.

An analysis of the case reveals how various steps taken during *acceptance* and *routinization* stages helped to mitigate some of the concerns. The training programs and workshops educated the employees and managers on both the technical aspects of using the system and the importance of data-driven decision-making. They also educated them on how use of the new system might simplify some of their work, and make it more effective. The training programs and workshops ensured that technical difficulties involved in operation of the new PMS didn't hinder the usage of the system. Moreover, they helped mitigate the impact of reduced managerial discretion in performance evaluation on user acceptance of the system, by highlighting the benefits of using the system.

The various steps taken by RCL to elicit user participation helped mitigate uncertainty regarding the system. Also, it promoted acceptance of system by incorporating the needs of the employees. Discussions with various groups of employees, conducted at the beginning of the project turned out to be particularly helpful. They generated a sense of participation among the employees, helped them understand the benefits of the system, and allowed them to flag their concerns. Insights from the discussions also allowed RCL to add features to the PMS as needed and suggested by employees. Similarly, early identification of managers, who were convinced about the role and importance of the new PMS, and involving them in the design of the system was a smart strategy. These managers helped project team understand the user needs, and design a more usable interface for users. Moreover, an endorsement from these managers, played an important role in acceptance of the system, as it was deemed more credible by employees than messages conveyed by the IT department. The positioning of the PMS also played a critical role in its overall acceptance by the employees. Every new version of the PMS was positioned as a trial version, and the employees were encouraged to suggest changes. This generated trust among the employees. And helped refine the system, by incorporating user interests and requirements, as much as possible.

As discussed in the case, an important insight, which emerged from the user discussion was that there was a self-selection of the system by the employees. One set of employees was satisfied with greater transparency brought in

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by the new system and believed that it would help bring in fairness and lead to higher performance levels. Another set of employees, however, felt threatened by the new PMS and was likely to resist the system. More importantly, the latter consisted largely of those employees who had been manipulating the existing PMS. The set of measures employed by RCL for employee participation and education was effective in ensuring system acceptance among the former set of employees only. To counter potential resistance from employees, who had been manipulating the system, coercive measures were employed by RCL, including monitoring of usage of the system, and making it mandatory to use the new PMS during performance review meetings.

Infusion - As explained in the case, the new PMS enabled a better managerial control, which was also reflected in higher satisfaction among senior management. This was primarily facilitated by advanced IT systems, which made it easier to analyze performance related data. Besides, increased transparency of the PMS made it difficult to manipulate the system and led to a higher morale among employees who had been working diligently. It also led to higher customer satisfaction. All of these might be assumed to contribute towards higher productivity.

CSF in implementation of PMS

One of the research questions that we stated in the introduction was whether it was possible to uncover the CSF that impacted the implementation of a PMS at a firm. We detail the following steps which may be used to answer that question using the PMSIF.

Step 1: The factors affecting the success of each of the individual stages of PMS implementation were identified and marked as CSF. As the PMS implementation at RCL was enabled by the use of BI, the observed CSF may also be considered as CSF affecting BI implementation to support performance measurement at RCL. Table 4 lists and explains the CSF observed from the case study.

Stage	**CSF**	**Description**	**Relevant quotes**
Initiation	Assessment of BI capabilities and its relevance for business needs.	At RCL, technological capabilities offered by BI aligned well with the current business needs of the firm. This played an important role in the overall success of BI at the organization.	"*There were problems in reviewing performance and take corrective actions due to the non-standard way of reporting and KPIs in the legacy system, particularly when the organization had grown from a single unit company to a multi-unit one. Features offered by*

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			modern BI systems seemed to provide tailor made solutions for our problems" Senior Manager, Marketing, RCL
Adoption	Top management support.	Top management support ensured that the decision to adopt BI wasn't overruled because of political and vested interests of negatively-impacted stakeholders.	*"Benefits were clear and our leadership team supported it [BI adoption] fully. Decision [to adopt BI] was smooth."* Assistant Vice President, IT, RCL
Adaptation	Ensuring system quality. Re-engineering of performance measurement processes. Top management support.	System quality provided control capabilities to senior management to enforce changes to the PMS. A systematic re-thinking of processes (e.g., building of a new KPI library and enforcing the use of the KPI library) was critical in the design of the new system. Top management support was important to manage resistance from certain sections of employees.	*"At the core, this [PerfMon] project was about re-thinking how we defined, measured and used KPIs in RCL."* *"In many ways, the efficacy of the BI system made the project possible."* *"PerfMon was a top priority project for our leadership team and it helped."* Assistant Vice President, IT, RCL
Acceptance and Routinization	Change management activities. Identifying project champions. Identifying user needs.	A right combination of user-oriented measures and coercive measures helped in the acceptance and subsequent routinization of the PMS. An initial discussion with the users helped to understand the users' perspective	*"An important principle, which we followed throughout the implementation, was to be empathetic towards the needs of the users. An IT system adds value only as long as it is used."* Assistant Vice President, IT, RCL

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	Top management support.	and helped to design a system that was suitable for them. Likewise, project champions helped in understanding users' needs and concerns better at various stages. Similar to earlier stages, top management support was important in the smooth execution of various steps at this stage.	
Infusion	Qualitative / quantitative assessment of benefits.	A fair and transparent assessment / measurement of benefits arising out of the system was important to ensure that RCL generated value from its use.	*"Management, customers and sales staff, everyone is happy with the system now."* Assistant Vice President, IT, RCL

Table 4: CSF affecting PMS implementation at RCL.

Step 2: While several papers have discussed the CSF affecting BI implementation, for the purpose of this analysis, the CSF outlined by Yeoh & Koronios (2010) were used as the CSF affecting implementation of a generic BI system at an organization.

Step 3: To highlight the CSF that were uniquely important for BI implementation in a performance measurement context, the CSF observed in the RCL case were compared with the CSF outlined in Yeah & Koronios (2010). A summary of the comparison is presented in Table 5 below and discussed later. Discrepancies between the observed findings and extant literature have been explained as well. The findings help to extend the boundaries of BI literature by identifying the CSF affecting BI implementation in the context of performance measurement.

Yeoh & Koronios (2010)	**RCL Case**	**Comments**
Committed management support and championship.	Top management support played an important role at various stages of implementation.	Consistent with Yeoh & Koronios (2010).

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Clear vision and well-established business case.	RCL had a strong business case for BI. It helped ensure that the decision to adopt and use the system was smooth.	Consistent with Yeoh & Koronios (2010).
Business-centric championship and balanced team composition.	Project champions helped RCL in understanding user needs and concerns better. BI implementation was largely driven by the IT department.	Partially consistent with Yeoh & Koronios (2010) as the IT team's role was most prominent.
Business-driven and iterative development approach.	RCL kept business interests at the top and repeatedly enhanced the system to conform to genuine needs of users.	Consistent with Yeoh & Koronios (2010).
User-oriented change management.	A combination of user-oriented measures and coercive measures helped drive change management at RCL.	Partially consistent with Yeoh & Koronios (2010). Use of coercive measures for change management is a novel finding from the RCL case.
Business-driven, scalable and flexible technical framework.	System quality was critical for the success of BI implementation at RCL. However, scalability or flexibility of technical architecture was not observed as a CSF.	Not observed at RCL.
Sustainable data quality and integrity.	System quality was critical in the success of BI implementation at RCL.	Consistent with Yeoh & Koronios (2010).
Not reported.	Audit of technological capabilities.	Identification of relevant technological capabilities to drive process changes and / or support decision making was a key factor that determined success of the system.

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Not reported.	Business process re-engineering.	Re-engineering of performance measurement processes was critical for the success of the PMS at RCL.
Not reported.	Assessment of benefits.	Since PMS implementation is a risky and political process, a fair and transparent assessment of benefits was important for RCL.

Table 5: A comparison of CSF observed at RCL and those proposed in Yeoh & Koronios (2010).

As shown in the above table, several findings in the case reinforced the results of previous studies. Similar to the observation in papers on BI implementation, the RCL case showed the impact of a clear business vision for BI on the success of BI implementation (Watson, Goodhue, & Wixom, 2002; Seah, Hsieh, & Weng, 2010). The critical role of top management and project champions, observed in earlier studies, is confirmed by the case (Seah et al., 2010; Yeoh & Koronios, 2010; Yeoh & Popovič, 2016). On the technical side, the importance of rich data and data quality is reinforced in the RCL case (Abrahams, Jiao, Wang, & Fan, 2012; Bhargava, Power, & Sun, 2007).

At the same time, several discrepancies are also observed. First, three factors: *Audit of technological capabilities, Business process re-engineering and Assessment of benefits,* which are observed as CSF in the RCL case are not reported as CSF in the extant literature. An analysis of the case and previous papers on BI implementation hints at the reasons for the three factors being observed as CSF in a performance measurement context, but not reported as such in a generic BI implementation context.

First, in the absence of a specific business context, it is difficult to observe the significance of technological capabilities of individual applications. The role and significance of IT infrastructure to support a broad array of applications is more apparent. This may be the reason why scalability and flexibility of technological architecture was reported as a CSF for generic BI implementation, but an audit and understanding of specific technological capabilities was observed as a CSF in the RCL case.

Second, successful implementation of a PMS can enhance capabilities of a firm and potentially make it more competitive (Taticchi, Tonelli, & Cagnazzo, 2010). This makes it necessary to implement large-scale business process changes. A detailed discussion of changes made to the performance measurement processes at RCL has

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been discussed earlier and illustrates the importance of business process re-engineering while implementing a BI system. For applications where potential benefits are lower, it becomes costly and infeasible to re-engineer processes. As such, business process re-engineering may not be a CSF in any generic implementation and possibly therefore has not been reported as a CSF.

Third, PMS implementation is a large-scale project and often affects the entire organization. This makes it imperative to identify points where a firm may potentially benefit through its use and design mechanisms to assess benefits in a fair and transparent manner and report them to all affected stakeholders (Halachmi, 2002). This builds stakeholders' confidence in the new system and at the same time helps to rectify errors in the system. For smaller applications, assessment of benefits is less important as it involves low disruption and cost, and therefore is not reported as a CSF in previous papers examining generic BI implementation.

Additionally, certain CSF observed in the RCL case are only partially consistent with extant literature. First, previous papers recommend a balanced team composition while at RCL the implementation was largely driven by the IT team. We believe that a strong and committed support from the top management allowed the IT department of RCL to execute the project, with little disruption from other departments or stakeholders. Second, extant research has listed user-oriented change management as a CSF, whereas at RCL a combination of user-oriented measures and coercive measures was used. As discussed earlier, a change in PMS leads to a change in the balance of power and resentment among employees at various levels. Often, the system is resisted because of political reasons. This makes it critical to employ both user-oriented and coercive measures.

7. RESULTS AND IMPLICATIONS

The current study contributes to extant literature in several ways. First, it offers an integrated framework for end-to-end analysis of PMS implementation. The proposed framework is holistic, covering all aspects of PMS implementation: *people*, *process* and *technology*. Also, the framework covers the entire implementation exercise end-to-end, and thus bridges the gap in extant research.

The paper has major implications for both future academic research and practice. First, the proposed framework provides a novel means for analyzing implementation of a PMS. Also, the framework can be used as a guiding lens while studying the individual aspects of implementation in greater detail, including adoption, project management, and user acceptance of PMS. Similarly, the framework can be used to explore and understand the dynamic relationship between organizational environment and PMS implementation during various stages of the

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project. Likewise, the proposed framework may be useful for practitioners to conceptualize and plan for PMS implementation. Specifically, the framework may be used to identify potential challenges and pitfalls associated with various stages of implementation of a PMS (e.g., resistance by employees) and plan accordingly. It may also be helpful to apprise senior management of these challenges, which may ensure continued support from management even during periods of uneven progress (owing to these challenges) during implementation. Also, the framework may help the project team balance the interests of various sections of employees, which is critical to ensure the acceptance of the PMS. In addition to these, analyzing the complexity of executing various stages may allow a firm estimate the timelines for individual stages and the project as a whole. Second, the process view analysis, proposed as a part of the PMSIF allows a fine grained analysis of PMS implementation and provides specific levers to a firm to guide the implementation of a PMS. Third, the paper has formed a bridge between two important and related yet disconnected fields of performance measurement and BI implementation in an organization. This allows borrowing of theoretical literature from the IS discipline for understanding and exploring the phenomenon of performance measurement. The paper, thus, also effectively responds to the call made by Marchand & Raymond (2008) to enhance the literature on performance measurement by using rich theoretical literature developed in the IS discipline. Finally, the paper presents a detailed end-to-end case on implementation of a PMS in an organization. While case research has been used in the past to study individual aspects of PMS implementation, a detailed case covering end-to-end implementation has largely been missing from the academic literature. The case enables a better understanding of the phenomenon among the academic community. Also, the case provides important lessons for practitioners, which includes highlighting the importance of well-defined objectives and need for constant improvisation of the implementation plan based on learning at various stages. The results and implications have been summarized in Table 6.

Key contributions	**Academic implications**	**Practical implications**
Propose a novel theoretically grounded framework for holistic analysis of PMS implementation.	It extends literature on performance measurement by proposing a holistic framework covering process, people and technology aspects.	It helps to guide the implementation of PMS in an organization.
Connect research in performance measurement and	It shows how IS literature may be useful in performance measurement and thereby	NA.

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BI implementation.	responds to the call for the same from other researchers (Marchand & Raymond, 2008).	
Present a detailed end-to-end PMS implementation case study with interesting findings.	The case can be used as a reference for comparison with other academic case based research in future.	It details the successful implementation of a PMS and can act as a useful reference for firms planning to implement a BI-based PMS.
Propose and demonstrate the utility of the process view of analysis in performance measurement.	A novel method for fine-grained analysis of performance measurement.	It can be used to plan and prepare for roadblocks in PMS implementation (as illustrated in the RCL case).
Identify CSF for implementation of BI to support performance measurement.	It extends the BI literature by showing how the CSF for BI implementation differ in a performance measurement context.	It helps in planning for BI implementation to support performance measurement.
Show how advanced IT systems can be used for performance measurement.	It provides an interesting anecdote of how advanced IT systems (e.g., Google Map) can be used in firms. May motivate future research in this area.	It illustrates how advanced IT systems / BI can be used in implementation of PMS.

Table 6: A summary of results and implications of the study.

It may be noted that the current paper is the second in a series of research studies to understand the implementation, use and impact of BI, analytics and Big Data in organizations. The results of this study, may therefore be viewed as an extension of findings of the previous paper in the project, Dutta & Bose (2015). Specifically, Dutta & Bose (2015) proposed a framework for implementation of Big Data projects, designed in a way so as to be applicable to guide the implementation of such projects in an organization. On the contrary, the current paper proposes a theoretically-grounded framework for implementing a PMS and provides a detailed explanation of the different steps involved in the implementation of an IT based PMS. In

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other words, while the framework proposed by Dutta & Bose (2015) is generic, the framework proposed in the current paper is specific, and therefore more detailed and relevant in the context of PMS implementation. Dutta & Bose (2015) focused on planning a Big Data project whereas the current paper focused on planning, execution, and change management related to implementation of a PMS.

8. CONCLUSION

The framework proposed in this paper provides a novel conceptualization for implementation of a PMS. It is grounded in literature and provides an integrated view of implementation of PMS, covering all steps from planning to realization of benefits. The framework will be useful both for academic community in analysis of the implementation of a PMS and for practitioners planning to implement a new IT-based PMS in an organization.

A limitation of the paper is that the proposed framework has been validated by a single case. A single case study analysis allows investigating a "contemporary phenomenon in depth and within its real-life context, especially when the boundaries between phenomenon and context are not clearly evident" (Yin, 2014). As such, while the single case study approach allowed us to examine the implementation of a PMS in depth, generalizability of the findings is a limitation of this research. In particular, it should be noted that the case pertains to a firm from a specific industry and geography, and findings of the study should be cautiously interpreted and used in other contexts.

The study can be extended by follow-up studies to validate and refine the proposed framework. Specifically, the validity of framework may be tested across the implementation of PMS in different industries and geographies. Also, the challenges of using the framework and implementing a PMS across different industry verticals may be compared. It is hoped that the framework will provide a basis to extend the boundaries of knowledge of PMS implementation and future studies will enrich the framework and enhance its utility for researchers.

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APPENDIX

Paper	**Major contribution**
(Cooper & Kaplan, 1988), (Simons, 2013).	Suggested use of simple financial measures as proxies for measuring performance.
(Kaplan & Norton, 1992), (Kaplan & Norton, 1996).	Suggested the use of a balanced set of measures (both financial and non-financial) to measure performance, and an effective cascading of goals across hierarchy through the use of these measures (Balanced Scorecard Framework).
(Flapper, Fortuin, & Stoop, 1996).	Focused on consistency of performance measures and proposed a method for developing a consistent PMS (Consistent PMS Framework).
(Bititci, Turner, & Begemann, 2000).	Suggested that a PMS should be dynamic to reflect changes in internal and external environment (Dynamic PMS Framework).
(Neely, Adams, & Crowe,	Proposed design and development of performance measures considering

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2001).	interests of all stakeholders and not just shareholders (Performance Prism Framework).
(Kanji & e Sá, 2002).	Proposed the development of performance measures so as to achieve business excellence by ensuring both shareholder satisfaction and other stakeholders' delight, organizational learning and process excellence (Kanji's Comparative Business Scorecard Framework).
(Sureshchandar & Leisten, 2005).	Proposed the use of an integrated scorecard for managing performance, covering financial, customer, business process, intellectual capital, employee and social perspectives (Holistic Scorecard Framework).
(Barnabè, 2011).	Proposed integrating the Balance Scorecard method with Systems Dynamics approach (System Dynamics Based Balanced Scorecard).

Table A1: Extant research on performance metrics and corresponding organizational changes.

Paper	**Major contribution**
(Bititci, Carrie, & McDevitt, 1997).	Recognized and positioned IT as a critical component of PMS.
(Kueng, Meier, & Wettstein, 2001).	Discussed how the existing shortcomings in the design of a PMS could be bridged using IT.
(Bose, 2006).	Discussed how data systems related to performance measurement may be effectively managed.
(Creamer & Freund, 2010).	Proposed a framework for using business analytics in performance measurement.
(Rabl & Gómez-Villamor, 2012).	Studied the pros and cons of using different open source data stores for handling high frequency data in the context of performance measurement.
(Sidorova, Arnaboldi, & Radaelli, 2016).	Discussed the relevance of social media in performance measurement.
(Vera-Baquero, Colomo-Palacios, & Molloy, 2016).	Proposed a cloud based technology architecture for performance measurement.

Table A2: Role and impact of technology in implementation of a new PMS.

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Paper	Major contribution
(Bourne et al., 2000).	Observed that a change in performance measurement activities might lead to a redistribution of power in a firm, and therefore, attract resistance from a section of employees.
(Kennerley & Neely, 2002).	Highlighted the importance of organization's readiness for change in adoption and use of a PMS.
(Bourne et al., 2002).	Identified two factors likely to play an important role in the implementation of a PMS: perceived benefits of the system, and top management support.
(A. a. De Waal & Counet, 2009).	Discussed how top management may help in mitigating the risk of failure in implementation of a PMS.
(Jääskeläinen & Sillanpää, 2013).	Suggested that commitment at the operative level is critical for effective implementation of a PMS.
(A. A. De Waal, 2003).	Studied the role of behavioural factors (of individuals) in successful implementation of a PMS.
(Marchand & Raymond, 2008).	Suggested that IS literature can be useful in studying performance measurement and proposed a framework for user acceptance of PMS.

Table A3: Organizational challenges associated with implementation of an IT based PMS.

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Highlights

- Business intelligence is used for development of a performance measurement system.
- An end-to-end framework for implementation of a performance measurement system is proposed.
- A systems implementation project at Ramco Cements Limited is examined using the framework.

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