

Critical Analysis of Performance Measurement and Management Systems: Exploratory Research

D. Helmi, M. Radouani, S.A.K. Kaya, B. El Fahime

Abstract— This article is dedicated to review the most popular (common) existing performance measurement and management (PMM) frameworks and systems and identify their strengths and weaknesses. We synthesize and evaluate them against the identified performance concepts required to develop a contemporary performance measurement and management systems. Finally, we come to the conclusion that none of them proposes a holistic approach. We think by advocating an activity-based approach for PMM. Activity is one of the sources of value creation, which is the ultimate goal of every organization. Moreover, the performance measure is the core element of continuous improvement philosophy.

Index Terms— Performance Measurement and Management Systems, Continuous Improvement, Contemporary Performance

I. INTRODUCTION

The existing literature about the performance discipline highlights the importance of performance measurement and management in organizations. It often focuses on the design of performance measures reflecting organizational objectives, the accomplishment of which ultimately creates value of the stakeholders.

In this context, performance measures act as management tools that are used as yardsticks to access the performance with regard to objective achievements. To satisfy objectives, activities are designed and implemented to support the achievement of these objectives and in turn determine the value creation process. However, this value creation process is subject to uncertainties in the form of risk factors, which negatively affect the process objectives.

Currently, the performance measurement and management literature stresses the importance of non-financial performance measures in addition to the financial ones [1] [2]. This paradigm shift towards non-financial performance comes because of the inadequacy on the part of financial performance measures as the sole indicators of organization performance [3].

The emergence of Balanced Scorecards has played a significant role in this paradigm shift whose major contribution to the performance measurement discipline is in the expansion of business focus from traditional financial performance measurement to the corporate non-financial

measurements [4] [5] [6]. It relies on four major strategic “perspectives” and each one has an integrated set of objectives, measures and initiatives to translate strategy into actions. Alignment of performance measures with strategy has been advocated vehemently in many integrated performance measurement systems [7].

In addition to BSC (FOLAN and BROWN 2005) term strategy as starting point for a performance measurement system (PMS) and define a step by step process for developing performance measure from strategy [8]. However, some authors criticize strategy as the starting point and put stakeholder’s expectations to be the driving force for performance measures derivations for PMS [9] [10].

In addition to performance measures as descriptors of performance and their alignment with organization strategy, the risk management literature also stresses the role of managing risk in performance improvement. To this end, the use of a wide range of techniques to manage risk in order to improve process performance is also advocated (ISO 31000).

Similarly, MARQUES & al. Include risk as one of the dimensions of performance besides cost, time and quality [11]. However, SEINO defines risk management process as the value preservation scheme for a business process. Of course, performance measurement and management systems and risk management techniques play a significant role in business processes management; they are taught and practiced in industry as well. However, they often fall by the wayside when it comes to performance assessment in the overarching sense.

Furthermore, the objective is to identify the strengths and weaknesses of the existing frameworks and systems and to get some insights for developing a new performance management system. From a review perspective, the existing frameworks and systems can be divided into three broad categories: financial-based performance measurement systems, performance models that propose recommendations and integrated performance measurement frameworks and systems and, hence, will analyze them in more details. After a thorough review and analysis of the most popular PMS frameworks and methods, we concluded that the existing systems for performance measures cannot give a measure in a holistic and integrated manner. They offer solutions in some areas but lack power in other domains. Moreover, the changing business trends forces the PMM systems to evolve constantly. Issues and challenges evoked in the state of art can be resolved to a large extent by employing an activity or process approach.

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II. FINANCIAL BASED PERFORMANCE MEASUREMENT SYSTEMS

Even though financial based PMSs were severely criticized due to their limitations, the accounting domain continues to address the issues of tradition PMSs while solely focusing on the financial aspect. This has resulted into modified performance measurement systems based on the financial aspect of performance such as activity based costing (ABC) and theory of constraints (TOC).

A. Activity based costing and Activity based Management (ABC/ABM)

The fundamental difference between an ABC system and a traditional costing systems is that the latter assumes that product cause costs, whereas ABC supposes that activity causes costs and the cost objects create demand for activities [12].

The Consortium for Advanced Management-International (CAM-I) defines ABC as follows: "Activity-Based Costing is a methodology that measures cost and performance of activities, resources and cost objects. Resources are designed to activities, then activities are assigned to cost objects based on the use of consumption of the relevant activities. Activity-based Costing recognizes the causal relationships of cost drivers to activities". The figure 1 represents the basic structure of ABC.

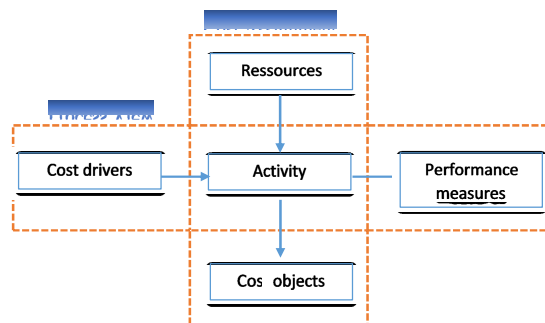


Figure 1: The basic structure of ABC.

From figure1, resources (i.e. economic elements that are applied in order to execute organization activities) are traced to activities (i.e. work performed within the organization) employing the resource cost drivers (i.e. factors which cause a change in the cost of an activity). Activities are then traced to cost objects (i.e. any customer, product, service, contract, project or other work unit for which a separate cost measurement is desired). Finally, performance measures are used to measure the output of an activity.

Activity-Based Management on the other hand is a broad umbrella term that includes Activity Management, Activity Cost and Activity-Based Product Costing as well as many of the concepts associated with-in-time and theory of constraints.

B. Theory of Constraints

The theory of constraints (TOC) is an overall management philosophy developed by Goldratt [2009]. It later emerged as a process of on-going improvement and geared to help organizations continuously improve the performance of a process by focusing on the constraints.

Conceptually the TOC is based on the idea that any organization has identifiable constraints. A constraint within a

system, and hence in a process, is anything that limits the process from achieving these constraints and manage them so that resources are used most efficiently. The Goal is simply to make money by maximizing a global measure called throughput while minimizing two other global measures referred to as Inventory and Operating expenses. The theory of constraints relies on these three global performance measures for assessing an organization to achieve the goal (i.e. making money).

The TOC's five steps of focusing are conducted in the following way:

- Identify the system constraints
- Decide how to exploit the system constraints
- Subordinate everything else to the above decision
- Eliminate the system constraints
- If in the previous step, a constraint has been broken, go back to step 1.

To summarize, the performance measure within TOC approach are easy to access and simple to understand. However, TOC is far from being a complete PMS as it simplifies a reality a little too far. In addition, it supposes that there is always a constraint in a system (or process), which is not necessarily true.

III. PERFORMANCE MODELS PROPOSING RECOMMENDATIONS

Researchers and practitioners made attempts to offset the inadequacy of traditional performance measurement systems. The inadequacy is related to the dimensions of performance, implementation mechanisms and their adaptation to the new business environment. In that respect, performance criteria system and performance measurements for world class manufacturing frameworks are noteworthy and are presented in the following paragraphs.

A. Performance criteria systems

A performance criteria systems (PCS) provides guidelines concerning performance criteria for developing a PMS. The four recommendations proposed by Globerson for PMS development are [13]:

- Choosing the preferred set of performance criteria
- Measuring the chosen performance criteria
- Assigning standards to the performance criteria
- Designing a feed-back loop to respond to discrepancies between standard and actual performance.

Moreover, Globerson provides three techniques which could be used for assigning weight (or relative importance) to each performance criteria and he suggests the use of the analytical hierarchy process technique of Soaty. He also provides techniques for assigning targets for each performance criterion.

B. Performance Measurement for Class Manufacturing

MASKELL focuses on developing and measuring different performance measures. He identifies that irrespective of performance measures used for evaluation of performance, which may vary considerably, they have the following seven common characteristics [14].

- They are directly related to the manufacturing strategy,
- They use non-financial measures in addition to financial measures,

- They vary with locations (i.e. part of a system, department, etc.),
- They are contextual,
- They are simply and easy to use,
- They provide feedback,
- They are used for improvement process rather than a simple control tool.

C. Performance Management System Frameworks

The framework is designed in the form of twelve questions outlined below:

- What is the vision and mission of organization?
 - What are the key success factors?
 - What is the organization structure and what impact does it have on the use of the PMS?
 - What strategies and plans has the organization adopted? What are the process and activities that is has decided that will be required for it ensure its success?
 - What are the organization's key performance measures?
 - What level of performance does the organization want to achieve for each level of performance level?
 - What processes, if any, the organization follows to evaluate performance?
 - What rewards- financial and non-financial- will managers and other employees get by achieving targets?
 - What specific information follows – feed-back and feed-forward - systems and networks has the organization in place to support the operation of its PMS?
 - What type of use is given to feed-back and feed-forward information flows and to the various control mechanisms in place? Is use predominantly diagnostic, interactive or a combination of both?
 - How has the PMS altered in the light of the change dynamics of the organization and its environment? Have the changes in PMS design or use been made in a proactive or reactive manner?
 - How strong and coherent are the links between the components of the PMS and the ways in which they are used?
- Of the above mentioned questions, the first eight ones are about the financial issues/question related to the management of ends (results) to achieve and the management of means (determinants) to achieve these ends. Whereas the last four ones are related to the contextual issues that give way to treat the first eight issues [15].

IV. INTEGRATED PERFORMANCE MEASUREMENT AND MANAGEMENT SYSTEMS

Integrated Performance Measurement and Management Systems (IPMMS) are information systems that incorporate both the financial and non-financial aspects of performance. According to Kaplan & Norton [4] [5] [6], focusing on individual performance measures such a cost, quality, time and flexibility will lead to local optimization. Therefore, performance measures must be treated in an integrated manner to support firm's strategy. In which the following questions: how to establish the integrated set of measures? How to implement them in order to better make use of and what characteristics an integrated performance measurement system should have? These and many other questions have been dealt in numerous integrated performance systems that are related in the following paragraphs.

A. Requirements of IPMM systems

According to FOLAN and BROWNE [8], Performance Measurement recommendations are the building blocks of all PM initiatives which can be grouped into two core areas:

- Recommendations for performance measures;
- Recommendations for PMS.

Moreover, they synthesize recommendations proposed by different authors for the development of performance measurement frameworks and systems (see appendix A). From the recommendations of appendix A, it can be concluded that, firstly, process oriented PM is not given heed so far. Secondly, the aggregation of performance measures within a PMS to simplify the performance reporting is also ignored. Furthermore, the role of PMM systems as decision making tools is equally not taken into account. Additionally, from appendix A, actual serviceable recommendations that can be used for PM frameworks or systems are rare. In the current article, based on the state-of-art and our experience we employ some recommendations that a PMM system should have in order to facilitate the PMM process. These requirements are:

- Objective/strategy driven: whether the system is driven by the organization strategy or not and the measures are aligned to the organization's strategy.
- Process oriented: whether the model or process employs a process approach or not.
- Stakeholder's perspective: the performance measurement system considers stakeholders needs while evaluating performance measurement.
- Control, improvement and learning: whether the performance measurement system suggests mechanisms to control (feedback loop) and aid in continuous improvement or not.
- Multiple performance dimensions: what specific dimensions (criteria) of performance the system takes into account.
- Integration mechanism: whether the performance dimensions are normalized and integrated or not.
- Criteria interaction: whether the system recognizes criteria interaction or not.
- Organization level: whether the organization hierarchy is addressed or not while evaluating performance.
- Risk assessment: whether risk management is dealt with or not.
- Decision system: does the performance measurement system have a decision system?

B. Integrated Performance Measurement Systems Review

The objective is to determine the strengths and weaknesses of each performance measurement framework and system developed against already defined attributes. It exists more than thirty five well known methods that have been deployed around the world for the determination and implementation of either performance measures or performance systems. We take into consideration for review only those that gained sufficient popularity in academia and industry.

C. Strategic Measurement Analysis and Reporting Technique

The Strategic Measurement Analysis and Reporting Technique (SMART), also known as performance pyramid, was developed at wang laboratory,inc., Massachusetts [16].

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The technique was first developed to implement a just-in-time approach, which was later extended to define a framework for:

- Measuring departments and functions on how they are contributing separately and together in meeting manufacturing strategic mission.
- Linking operations to strategic goals.
- Integrating financial and non-financial information in a way that can be used by operating managers.
- Focusing all business activities on the future requirements of business, as dedicated by the customer.
- Changing performance, incentive and rewards systems as necessary.

The SMART is illustrated in figure 2.



Figure 2: The Performance management system pyramid.

At the top level of the pyramid, a vision for the business is setup which forms the basis for corporate strategy. The senior management then assigns a corporate portfolio role to each business unit (cash flow, growth, innovation, etc.) and allocates resources to support them.

At the second level, objectives for each business unit are defined in market and financial terms. Strategies to reach these goals are worked out.

At the third level, more tangible operating objectives and priorities are defined in terms of customer satisfaction, flexibility and productivity.

At the fourth level, or foundation level, customer satisfaction, flexibility and productivity are represented by criteria such as quality, delivery, process time and cost. These criteria or operational measures are the keys to achieving higher level results and ensuring successful implementation of the company strategy.

D. Balanced Scorecards (BSC)

KAPLAN and NORTON [4] [5] [6] developed and promoted balanced scorecards (BSC) at Harvard Business School as a measurement framework for strategic, operational and financial measures. The balanced scorecard method proposes that an organization should use a balanced set of performance measures that will help top managers to take at a glance a comprehensive view of their business from four important perspectives as shown in figure 3

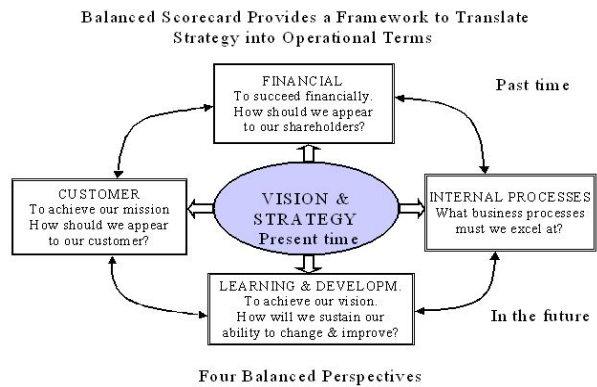


Figure 3: The Balanced Scorecard Framework

The concept of the balance scorecards is to align corporate values with operational objectives, customer satisfaction, shareholder values and expectations as well as individual employee's objectives, competencies and aspirations.

BSC answers four questions in general: how do we look to shareholders? (i.e. financial perspective); how do customers see us? (i.e. customer perspective); what must we excel at? (i.e. internal process perspective); and can we continue to improve and create value? (i.e. innovation and learning perspective). To be competitive and survive on the market, there must be a balance between the four perspectives.

E. Performance prism

The performance prism was developed at Granfield School of Management, United Kingdom. Prism advocates that a PMS should be organized around five distinct but linked perspectives of performance [9].

- Stakeholder satisfaction: who are the stakeholders and what do they want and need?
 - Strategies: what are strategies we require to ensure the wants and needs of our stakeholders?
 - Processes: what are the processes we have to put in place in order to allow our strategies to be delivered?
 - Capabilities: what are the capabilities we require to operate our processes?
 - Stakeholder contribution: what do we want and need from stakeholders to maintain and develop these capabilities?
- Figure 4 illustrate the prism performance measurement framework.

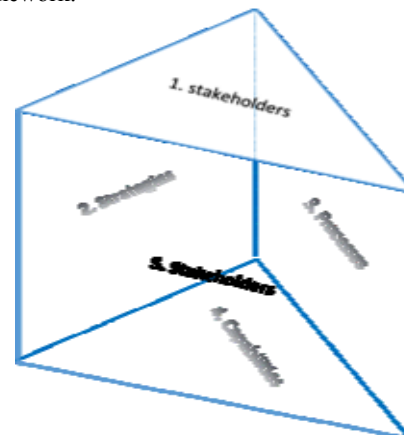


Figure 4: the Prism performance measurement framework.

The authors of the performance prism argue that it is the wants and needs of the stakeholders that first must be

considered. For this purpose, strategies are then devised and processes are designed and implemented in the light of already formulated strategies.

F. ECOGRAI Approach

The ECOGRAI methodology was developed by the GRAI laboratory at the University of Bordeaux (France), for measuring the performance of organizations [17]. The relationship between an objective, decision variables and performance indicators is depicted by figure 5.

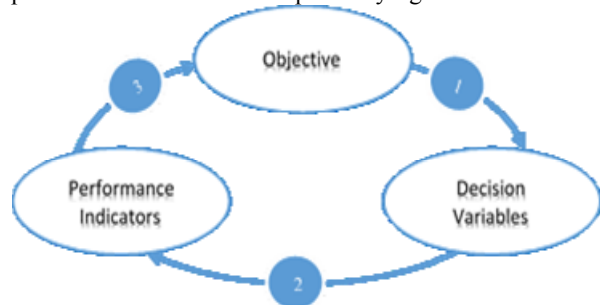


Figure 5: the ECOGRAI approach

The ECOGRAI method uses the GRAI nets and the GRAI grid to decompose global objectives into lower level objectives and to identify, for each level, decision variables and performance indicators. Figure 6 illustrates the logical structured approach to define performance. This approach is decomposed into six phases. The first phase models the control structure (i.e. decision system) and the controlled structure (i.e. physical transformation system). The following three phases concern the identification of coherent objectives and the decision variables. In the fourth phase, performance indicators are identified whereas, the fifth phase designs the information system to build the performance indicators. In the last and sixth phase, the performance indicators are implemented in the enterprise information system.

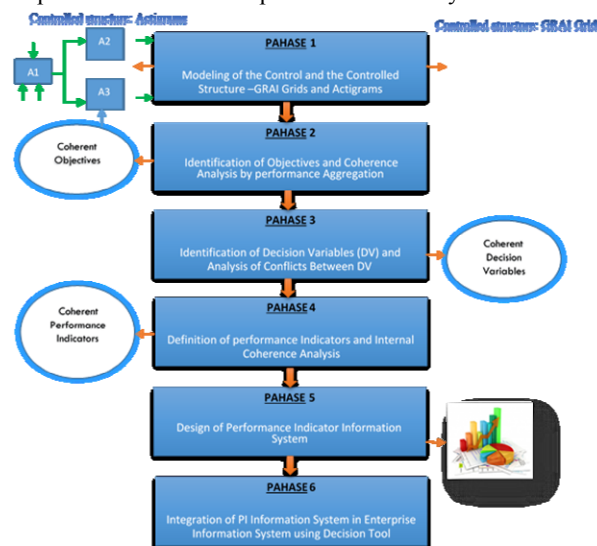


Figure 6: The ECOGRAI method

In brief, the ECOGRAI approach enables one to define a set of objectives for each hierarchical level of an organization such as strategic, tactical and operational levels. However, the identification of decisional variables and performance indicators is done at the operational level [18].

G. Integrated Performance Measurement System Model

The IPMS was developed by BITTICI et al, at the University of Strathclyde, (U.K) [19] [20]. The model has an audit methodology to assess robustness and integrity of PMS used within manufacturing industries. Figure 7 describes the IPMS model.

At each level of the business, the model requires the organization to:

- o Recognize and understand its stakeholder requirements
- o Externally monitor its position against competitors and world-class performance to identify the development needs of the business
- o Set objectives based on implications and criticality of the development needs together with appropriate targets and time scales
- o Define, report, monitor and review these objectives through a performance measure.

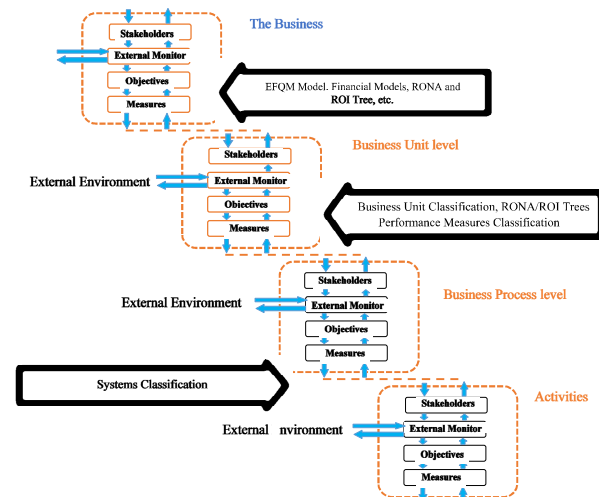


Figure 7: Integrated Performance Measurement System Model

H. Integrated Performance Measurement Framework

MEDARI and STEEPLE developed a performance measurement framework that contains two separate documents called (1) “Document”, which is a six stage plan (cf. figure 8) and (2) “Document B”, which is a spectrum checklist containing non-financial performance measures segregated by six competitive priorities [22].

The six stages of Document A include:

- o Stage 1: Company Success Factors
- o Stage 2: Performance Measurement Grid (PMG)
- o Stage 3: Selection of measures using spectrum/checklist
- o Stage 4: Audit
- o Stage 5: Implementation of measures
- o Stage 6: Periodic maintenance.

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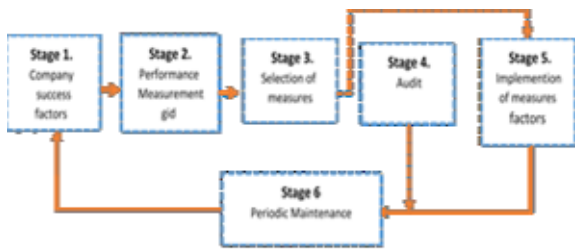


Figure 8: Integrated Performance Measurement Framework

The second document, “Document B”, contains 105 mainly non-financial measures, with full description and methods for calculation of each measures.

The authors claim that the framework is dedicated to achieve five objectives: firstly, it can aid in setting up a new performance measurement system if a company does not have any. Secondly, it has an audit capability to examine the existing measurement system. Thirdly, it can aid in identifying obsolete measures; fourthly, it can help a company to identify and select core non-financial measures not being measured (gap); and fifthly, it identifies the guidelines to implement any selected measures.

I. Quantitative Model Performance Measurement System

QMPMS was developed at the Center for Strategic Manufacturing, University of Strathclyde, UK [23]. The system models the relationships between performance measures in quantitative terms. There are three main steps in QMPMS (cf. figure 9):

- o Identification of factors affecting performance and their relationships
- o Structuring the factors hierarchically
- o Quantifying the effect of factors on performance

To conduct each steps, QMPMS relies on tools. The QMPMS model has a well-structured approach to identify and prioritize factors affecting performance of an organization. Besides, the model classifies performance measures and proposes the consolidation of the performance measure in order to reduce the number of performance measurement reports. Nevertheless, the aggregation mechanisms is not well defined and is based on simple weighted arithmetic average aggregation operator.

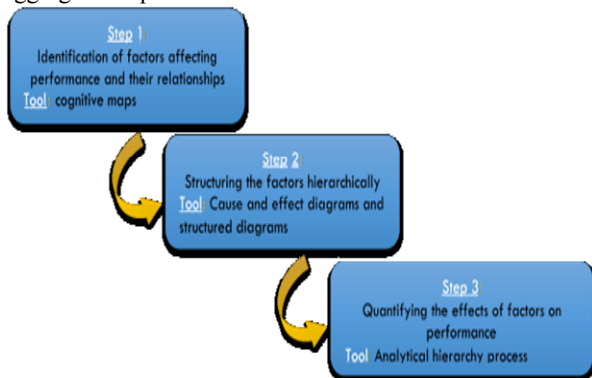


Figure 9: Quantitative Model Performance Measurement System

V. SYNTHESIS OF PERFORMANCE MEASUREMENT SYSTEMS COMPARISON

From the analysis of the performance measurement

frameworks and systems, it can be concluded that none of them respond to all the requirements desired. The most neglected attributes in the PMS systems are Risk assessment, process orientation and decision, making mechanisms.

Moreover, in the integrated approaches, the issue of multi-criteria analysis has been taken into consideration. There appears to be a consensus in academia and industry alike that performance in any organization has multi-facets and, hence, should be measured using multiple dimensions of performance. Therefore, the issue of criteria interaction has not yet been dealt with because criteria often interact either positively or negatively and affect the global performance. The emergence of information and communication technology has facilitated data collection because performance measurement is becoming common practice in every organization whether it is a profit or not for profit organization. Therefore, it is imperative to consider few critical performance measures and then aggregate them in such a way that they do not lose their significance in the aggregated performance measure. This aspect of performance, however, hasn’t been handled thoroughly in the current performance measurement systems.

Besides, the stakeholder’s perspective has been integrated in few performance measurement systems such as BSC and performance prism. However, these systems haven’t proposed yet the mechanisms to assess neither contributions nor profits.

Concerning performance at different level of the organization hierarchy, many PMSs (e.g. SMART or IMPS) take it into account. The performance hierarchy levels in organizations refer to the refinement of a global objectives into more manageable objectives and them their aggregation in a bottom-up sequence. Furthermore, risk management hasn’t yet taken roots in integrated PMSs. Similarly the literature review reveals the missing link of PMS to the decision making mechanism. The only PMSs (e.g. ECOGRAI or QMPMS) propose this relation. Summarily, after a thorough review and analysis of the most popular PMS frameworks and approaches, we can be concluded that the existing systems for PM cannot measure performance in a holistic and integrated manner. They offer solutions in some areas but lack power in other domains. The changing nature of business trends are being transforming the very landscape of the PMSs, hence making the existing PM approaches too restrictive or inadequate.

The traditional PMSs followed by modern PM and integrated systems are less relevant in the face of changing business environments. The solution lies in process based approaches and analysis of process activities.

VI. EPILOGUE

We conclude the study by advocating an activity- based method for PMM. Issue and challenges evoked in the literature review can be resolved to a large extend by employing an activity or process approach. Activity is one of the sources of value creation, which is the ultimate goal of every organization. Moreover, the PM encourage, continuous improvement of a process. Concerning the performance

measure, it is the core element of continuous improvement philosophy. According to the Shewhart-Deming's wheel or PDCA (Plan, Do, Check and Act), performance measure examines the effect of changes to see if the desired result is achieved. The aim is to correct the cause not the symptom for eradicating it permanently and so to bring in continuous improvement.

The Shewhart-Deming's wheel to create and to set up of key performance indicators (KPI) as shown in figure 10:

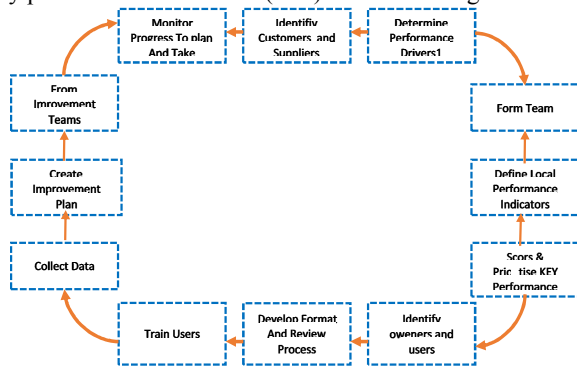


Figure 10: The Shewhart-Deming's wheel and key performance indicators

In addition, the issue of PMM in extended organizations can also be resolved because processes can be extrapolated across multiple units of organizations as well as across different organizations. Moreover, processes can be decomposed into sub-processes and to fundamental blocks, i.e. activities, along the hierarchy of the organization. However, horizontal and vertical integration is only possible through processes.

The most important aspect of activity based performance measurement and management is that activity is a modelable and simulatable element and presents numerous advantages. It simplifies the performance relevant issues of performance integration within and across organizations. It's one properly identified, modeling and simulation can then be used to measure performance before investments or real decisions are made.

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