Technology-enabled Maintenance Performance Management

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Abstract

Business Performance Management (BPM) is a series of processes and applications designed to optimize the execution of business strategy; indeed, organizations are discovering that BPM is more than just planning, budgeting, forecasting, consolidation, or scorecarding application-rather it is a common framework that underlays all above applications. Maintenance as an important process of organizations shall be covered by BPM. Through this paper, the modern meaning of BPM is sorted out, a four step process BPM framework is developed; furthermore the use of technology and tools in BPM is introduced in detail. Finally, future research topics are mentioned.

Keywords: Business Performance Management – Maintenance - Framework - Business Intelligence - Scorecard/Dashboard

1- Sorting out the concept of BPM

There are biases and confusion in defining the term BPM; Mostly, when the executives first hearing the term, they say: "Again another acronym"; to some others, it means Business Intelligence (BI), which is the processes and technologies to turn information into insight and action; and to other, it is another old trick of vendor community to sell already existing technologies! Indeed, BPM is real and it is distinct from BI; the main difference that BI is an enabling technology, whereas BPM is a business process which leverages BI. [1]

Many organizations today are confused about what BPM is-and is not; much of the confusion is that BPM is a new category to describe multiple applications that have already been implemented, including planning, budgeting, and KPI reports. When introduced the concept of BPM, many managers rightfully exclaim they have been executing that for years! However, most organization have not pulled these application together in a cohesive and concerted way-using a common strategic and technical framework to drive all parts of the organization toward a common set of goals and objectives.

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As a strategic and technical framework, BPM is still in an early adopter phase, similar to where data warehousing was in the mid-1990s; The Gartner Group estimates the percent of enterprises adopting BPM will increases from 10 percent in 2002 to 40 percent in 2006 [2].

Confusion also arises because industry experts can not agree what to call BPM, let alone how to define it, META Group and IDC use the term “Business Performance Management”, Gartner Group prefers “Corporate Performance Management”, and others favor “Enterprise Performance Management”. In conclusion, however, BPM is a series of processes and applications designed to optimize the execution of business strategy [3].

BPM processes and tools enable good management by making it easier for executives at all levels to identify, communicate, and monitor key drivers of business values. Once an organization understands its key value drivers and communications and calibrates them, it can then execute strategy by managing performance in the right direction. Sometimes it is easier to define things by describing what they are not. BPM is not:

- A Technology or software solution
- Business Intelligence
- Budgeting or planning
- Financial consolidation or reporting
- Scorecarding or dashboards
- Forecasting and scenario modeling
- Key Performance Indicators

The importance of each above applications in Business Performance Management is illustrated in figure 1.

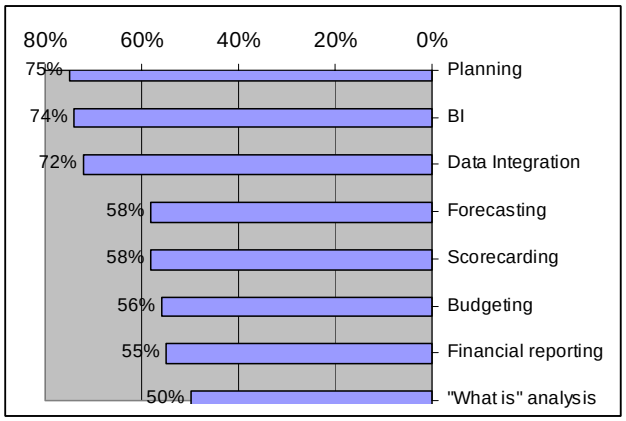

Fig. 1. Rate of importance to each application in BPM

2- BPM Benefits

BPM bridges the gap between strategy and execution; it is about getting everyone going in the same direction; indeed, BPM is not a slogan, cliché, or technology; It is the application of fundamentally sound business management practices enhanced by timely and accurate information in order to effectively communicate, comprehend, and control the performance of an organization.

BPM solutions close the gap in several ways:

- Improves Communication: BPM provides executives an effective mechanism for communicating strategy and expectations to managers and staff al all levels of the organization via planning models and performance metrics tied to corporate goals and objectives.
- Improves Collaboration: BPM also fosters a two-way exchange of ideas and information, both vertically between levels within an organization and horizontally among departments.

- Improves Control: BPM enables staff to continuously adjust plan and fix or improve operations in a timely manner by providing them with up-to-date information about market conditions and the status of operational areas.
- Improves Coordination: BPM Improves coordination among business units and functional groups that otherwise might act independently, hoarding rather than sharing resources and information

3- Maintenance Performance Management (MPM) Framework

If BPM automates the execution of business strategy and optimizes business management, what is the process by witch it works? A four step process framework can be defined for BPM which is also be applied in MPM; A closed-loop process that turns strategy into action in Fig. 2; the steps are:

- Strategize
- Plan
- Monitor
- Act and adjust

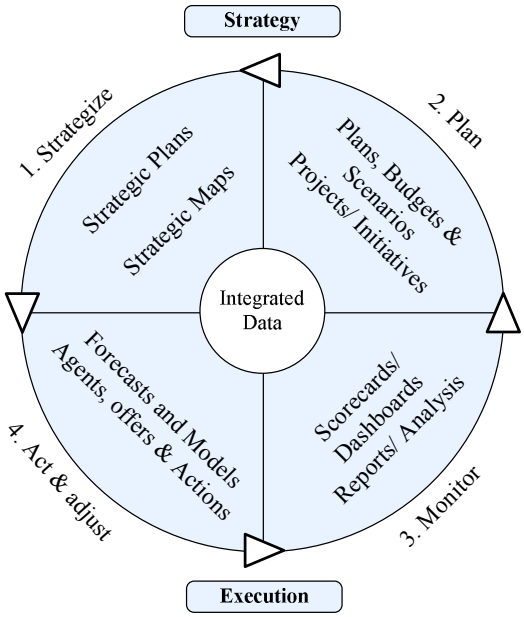

Fig. 2. BPM Framework

The first two steps in the top of the circular process- strategize and plan- constitutes the "strategy". The last two steps in the bottom half- monitor and act and adjust- define how to "execute" the strategy. Within each step, organization use enabling techniques or technologies (BPM products or solutions) to drive the process; for instance, the planning step uses applications and incentives to drives key strategies. The last step adjusts the strategy and plans to better conform to demands and shape of the market or customer base which closes the loop between strategy and execution. The KPIs uses in the process should [4]:

- Have standard measures
- Contain valid data
- Be easy to comprehend
- Provides context

- Lead to position action
- Empower users
- Maintain their relevance

Figure 3 shows overall maintenance performance indicators within a hierarchical structure [5].

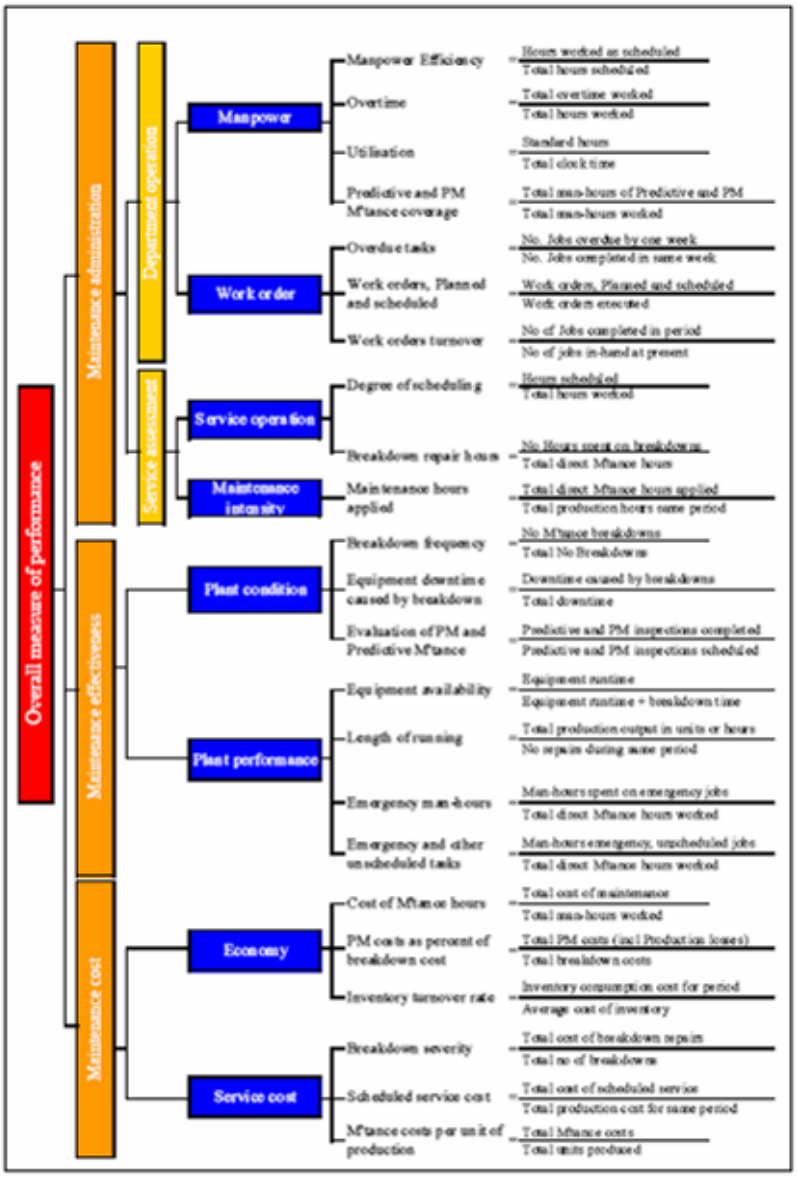

Fig. 3. Overall maintenance performance indicators

4- Business Intelligence: The Enabler Technology for BPM

Gartner, an information technology research firm, coined the term “Business Intelligence” during the 1990s. Business intelligence (BI) generally refers to the process of transforming the raw data companies collect from their various operations into usable information. It is a new term that incorporates a broad variety of processes and technologies to harvest and analyze specific information to help a business make sound decisions. Since data in its raw form is of fairly limited use, companies

are increasingly electing to use business intelligence software to realize their data's full potential. BI software comprises specialized computer programs that allow an enterprise to easily aggregate, manipulate, and display data as actionable information, or information that can be acted upon in making informed decisions.

For example, consider the data collected at a supermarket. Tens of thousands (even hundreds of thousands) of transactions are recorded at the checkout counter every day. Looking at this transactional data in its raw form, one could glean basic information such as which items were sold and when, and how much they were sold for. However, by implementing BI software, the supermarket can turn that raw product data into information and use that information to gain more profound insight into their business in other words the supermarket can determine bigger-picture insight such as how discounts and promotions impact sales trends, which items are selling best in each department and which of their store locations is best at selling a specific product line. Armed with this knowledge the supermarket's management can better plan for the future. By tracking buying trends of the customers, the purchasing department knows which products to stock up on. Moreover, management can obtain such information as products that are commonly purchased together, like hotdogs and mustard, so that they can better position them on the shelves, thereby increasing revenue. Promotions that do well in impacting sales in a test location can be replicated across the chain in order to boost sales and profitability [6].

Using business intelligence (BI) technology, businesses today can now refine the vast volumes of enterprise data into valuable information. The information can now also be distributed to all employees in the enterprise, thereby empowering employees to monitor their areas of responsibility and improve business efficiency. By providing seamless information flow, BI is carried out to gain sustainable competitive advantage and is a valuable core competence in some instances.

Companies can now react faster, with more insight, to constantly changing market demands [7]. The three major categories of analytic tools are Traditional querying and reporting, OLAP (Online Analytical Processing), and Data mining (Figure 4). The first two pretty much provide answers on questions we feel we need to ask or for values we have determined we need to produce. Users may say, "I may not know how to create a report for profitability by product for all segments, but I know I need it. I may not like what I see when I get it, but it is what I asked for." Data mining is a very different beast. There are numerous algorithms available in different tools, and the most intriguing are those that perform data discovery types of operations. Here, users say, "I need a tool that simply makes me think outside of the box. I need something to show me what I ought to look at!."

Recalling the tools pyramid, the largest segment of the user population was supported by query and reporting which are shared in Supporting the leading databases and most common file formats, Generating standard SQL, Handling large queries and result sets and etc. One way to identify an OLAP solution and its applicability (based on multidimensionality) over traditional query solutions is if a pattern of queries that are similar but slightly different is seen. Each level of detail is a slight variation of the previous. The same goes for data mining. If users are creating and executing query after query in the hope of identifying some anomaly or aberration in the data, mining may be able to point out such results in a fraction of the time. The quest is to use BI intelligently and to change the business, not just getting tools investment back by the sheer volume of the queries executed!

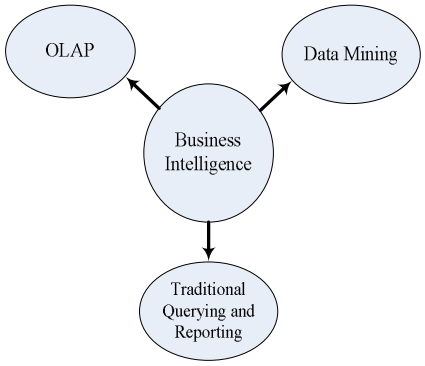

Fig. 4. Three major categories of BI

5- BI Architecture

A typical BI architecture is shown in figure 5; multiple sources of data are involved in corporation data-factory: operational databases, Enterprise Resource Planning (ERP), Customer Relationship Management (CRM), Supply Chain Management (SCM), World Wide Web and other portals. The architecture includes tools for extracting data form mentioned resources for cleaning, transforming, and integrating and refreshing the datawarehouse (subject-oriented, integrated, time-varying, non-volatile collection of data) to reflect updates at the resources.(ETL or ETLR tools). The repository manages metadata (data about the data) and tools for monitoring and administrating the warehouse system. Cleansed and integrated data go further through the departmental data mart (instead of a unique datawarehouse for the entire corporation, witch both shall be connected through an OLAP server witch serves and provide multidimensional data either for an OLAP tool (Fast Analyzer of Shared Multidimensional Information), or for other suitable tools like data mining or querying/reporting [8]. But what shall be a "Must" tool at the end of the architecture? The answer is comprehensive visualization tools.

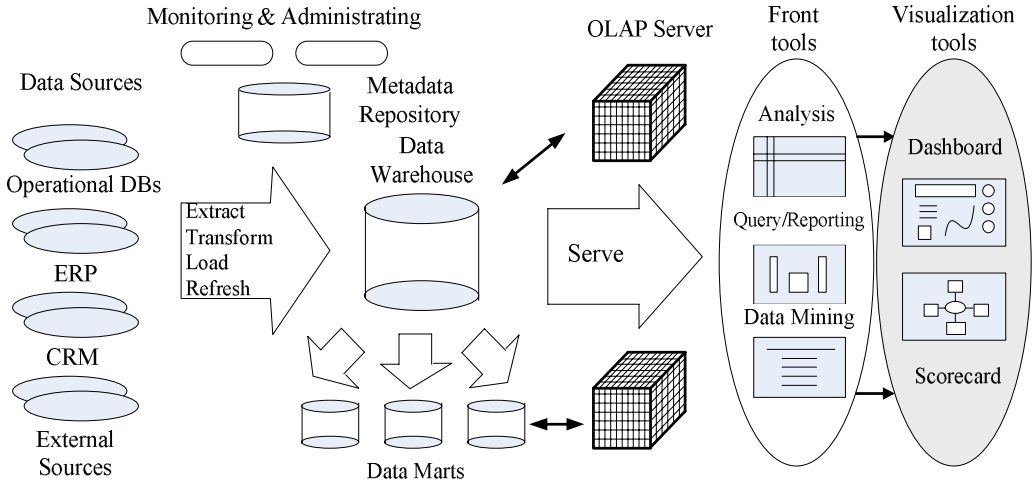

Fig. 5. BI Architecture

6- Business Visualization Tools: Scorecards/ Dashboards

A scorecard is an application or custom user interface that helps you manage your organization's performance by understanding, optimizing, and aligning organizational units, business processes, and individuals. It should also provide internal and industry benchmarks, goals, and targets that help individuals understand their contributions to the organization. This performance management should span the operational, tactical, and strategic aspects of the business and its decisions. You can use a methodology derived from internal best practices or an external industry methodology. (For

example, the term "Balanced Scorecard" is a specific reference to the Kaplan & Norton methodology.) [9]

Dashboard is conceptually a subset of a scorecard; it focuses on communicating performance information. Just like an automobile dashboard, it has meters and gauges that represent underlying information. A dashboard may also have some basic controls or knobs that provide feedback and collaboration abilities.

Management dashboards help organizations reach stated goals by leveraging information and analytics. They provide alignment, visibility, and collaboration across the organization by allowing business users to define, monitor, and analyze business performance via Key Performance Indicators (KPIs). Whether organizations choose to implement strategic or tactical performance management initiatives, dashboards can provide the foundation for enabling organizations to more effectively align their business strategy with execution [10].

A dashboard is a visual display of the most important information needed to achieve one or more objectives, consolidated and arranged on a single screen so the information can be monitored at a glance. The essential characteristic of a dashboard is that it displays information on a single screen and does so in a way that allows you to monitor that information - getting what you need from it - quickly and easily. This might sound simple, but it is not. The ability to make a screen full of information instantly understandable is a grand achievement of elegant design. It requires visual design skills that are far from common and software with display widgets that are intentionally and expertly designed to work well on a dashboard. Most dashboard vendors have focused on coming up with the cutest and most realistic looking meters, gauges and traffic lights possible, rather than seriously considering the unique opportunities and design challenges of dashboards to produce immediate insight. They've forgotten that the goal of a dashboard - the only goal - is communication! [11]. snapshots of sample dashboards are demonstrated in figure 6.

Figure 5. Sample Dashboard Snapshots

7- Dashboard Requirements

Three crucial requirements should be considered during dashboard planning, designing and development [9, 10, 12]:

- Organizational needs
- Business user needs
- IT needs

7-1- Dashboard Organizational needs

- **Alignment**: Improved organizational execution of corporate strategies can be derived from aligning the entire business with commonly agreed upon goals and objectives. According to strategy consultants at A.T. Kearney, "Alignment within the organization is achieved by cascading the strategy to the various units and providing separate but linked measures". Many dashboard initiatives begin by aligning departments with objectives that address the most acute pains in the business. Broader performance management centric dashboards will take alignment a step further by proactively and purposely supporting enterprise strategic goals with selected operational objectives.
- **Visibility**: Many dashboard initiatives begin by aligning departments with objectives that address the most acute pains in the business. Broader performance management centric dashboards will take alignment a step further by proactively and purposely supporting enterprise strategic goals with selected operational objectives.
- **Collaboration**: Collaboration in the dashboard environment allows people to work as richly as possible with other people across teams, departments, enterprises, or geographic areas. Collaboration within dashboard environments allows organization to share knowledge by providing them with a single view of data and KPIs, joint decision making, and extranet dashboards. Gartner has noted this trend towards extranet dashboards, saying that between organizations, successful collaborations "must involve the joint definition of metrics, which reinforces win-win relationships [13].

7-2- Dashboard Business user needs

- **Intuition**: a management dashboard must be easy to use in order to ensure user adoption. As DM Review states, "The dashboard framework must present an 'easy-to-read' web-enabled snapshot of the defined KPIs [14]. Performance indicators should include crisp, clear interactive graphs and gauges that provide instinctive visualization of organizational performance. Business users should require little to no training. Instead, the dashboard should tell its own story.
- **Personalization**: users can define and select the specific metrics that they wish to track and analyze depending on their operational and functional needs. In addition, individual users and communities of users typically have preferences on how they wish to view and display various indicators.
- **Powerful, interactive insight**: management dashboards must present actionable information to decision makers in a form that they can apply. Simple static reporting is not enough. To begin, dashboards need robust KPIs that communicate how the business is progressing towards defined goals; Capabilities like root-cause analysis, time-series analysis, predictive analysis and segment analysis are required.

7-3- Dashboard IT needs

- **Rapid Development**: The ERP, CRM, and data warehouse deployments of the 1990s strained many IT budgets. Numerous organizations struggled through multi-year implementations with systems that, to this day, have not delivered on the promised value. Today, performance management and dashboard initiatives must show ROI in months rather than years!
- **Leverage existing Infrastructure**: The aggressive move to use management dashboards allows organizations to leverage their existing technology investments as well as deploy a solution with a rapid ROI. Large enterprises have spent tens of millions of dollars in ERP, data warehouse, and enterprise software, yet still struggle to get the information they need out of those systems. Furthermore, those systems do not talk to each other. Management dashboards unleash the value within these investments. It accomplishes this by providing a comprehensive single view of management operations across these multiple systems and geographies. Many management dashboard applications, however, are not designed for optimal extraction of information from these various application sources. They are often vendor application specific solutions that do not provide native access to other sources or do not provide adequate cross-data source tracking and analysis capabilities. These limitations have a significant impact on dashboard data access performance. They often impact data quality and inevitably prevent true cross-organizational visibility and insight. Fully leveraging the existing infrastructure requires direct connectivity to underlying operational data sources and data warehouses/marts. This means that IT needs multi-data source, multi-application access and integration capabilities. Also necessary is a common data model that can resolve complex multi-metadata definitions and provide consistent metadata and KPI definitions across all enterprise data sources.
- **Being part of the enterprise BI Strategy**: While the foundation of corporate performance management is a combination of methodologies, processes, and metrics tailored to an enterprise's needs, a CPM solution will only become truly effective when it is embodied in systems. This is where BI plays a crucial role. CPM represents the strategic deployment of BI. BI applications deployed as part of a comprehensive strategy provide an environment that can effectively embed CPM in an enterprise [15].

8- Conclusion

Business Performance as stated is a series of processes and applications designed to optimize the execution of business strategy and maintenance is one of critical processes that should be covered by BPM. To understand and effectively design and implement such a solution a four steps closed-loop process framework is required: Strategize, Plan, Monitor, and act and adjust. Business Intelligence is introduced as a enabler technology for BPM, which can leverage the BPM applications in a packaged analytic solutions; Finally, dashboards and scorecard are introduced as the last component and the critical one of the BI architecture with its their three organizational, business user and IT needs. To conclude, role of analytic applications in BPM, BPM trends and market analysis, and BPM/KPI localization, are interesting future research topics.

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