

System of production monitoring based on KPIs

Valery Lubneuski

INCREASING PRODUCTION

performance is of vital importance for any production enterprise. An essential condition for solving the problem is creation of an easy-to-use, multi-level system of managerial accounting and production performance analysis. The system should provide clear results for top managers, economists and linear specialists.

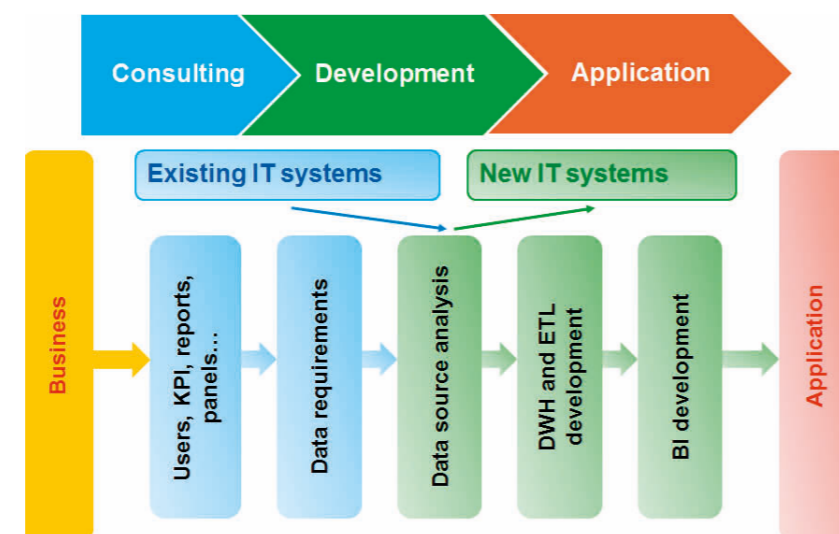
Let us examine basic approaches to the creation of such systems using up-to-date information technologies.

Currently, enterprises widely use different performance indicators, including net profit (NP) or Return on Investment (ROI). However, these indicators only state the achieved results for top management, for shareholders, and for the managing companies, leaving out the operational management level.

For daily operational management, completely different indicators are needed. These are the indicators that can provide information not only about the past, but also about the present, predict the future, detect bottlenecks in the company's operation, and enable managers to make timely and grounded decisions.

At present, numerous indicators are available, even in each specific area of company's activity, such as selection of suppliers, management of production, technical support, and other. In reality, only 5-7 basic indicators are relevant for the strategic management level and approximately the same number for each other group of users, including functional managers and employees of structural divisions.

To develop a unified system of indicators even for similar companies working in the same industry may be complicated because of different operation conditions, different



Pic. 1 Process of creation of production efficiency management system

organizational structures, different strategies of manufacture and sales of products, and other reasons. Therefore, it is essential to develop a system of indicators before creating a system of operational monitoring and production performance management.

The system of indicators can be developed by employees of the company at which production monitoring is organized. However, in such cases the results are often not acceptable because the employees are skewed by stereotypes, the methodology for the development of indicator systems is not available, and the members of the working group have to focus on their primary tasks and duties.

Alternatively, external consultants can be hired. To this end, it is important that the external consultants organize the process of KPI development instead of offering what is "right" in their view. The consultants should implement step-by-step methodology to solve the following tasks:

- Organize a working group that includes the enterprise' specialists in

the relevant aspect of operation.

- Within the working group, define and finalise with the company's management the project's goals.
- Analyse the applied indicators, assess their usability and possibilities for manipulation by employees.
- Inform the working group about other indicators that are utilised in the industry or area.
- Organise development of a new system of indicators by the working group.
- For each indicator, define the aim, reliability, range of values, and employees in charge.

Calculation of production costs based on cost accounting is the most commonly used way to evaluate production effectiveness. The main shortcomings of this method are that the calculations are complicated, the results are slow to get, and it is impossible to assess the economic benefits of many operational and strategic management decisions.

People typically believe that any cost saving leads to profit markup. In

practice, it is not always the case. For example, the reduction of equipment repair costs brings a decrease of the overall cost. However, it may also lower the reliability of the equipment, resulting in downtime or defects with the losses that exceed the savings in the repair budget. Thus, the optimisation of repair costs often leads to the losses in total production efficiency.

Therefore, I would recommend using the Theory of Constraints as a basis for the implementation of the operational managerial accounting. The essence of the approach is to group the expenses into those that are variable and depend on the manufactured products and those that are constant, irrespective of the type of manufactured products and are not split across the product. Unlike the accounting based on a total cost, the cost analysis can be performed during the process of production and not just after the end of the accounting periods.

In addition, the operational analysis of profitability for different contracts and production processes becomes available.

On the shop floor level, especially if a Manufacturing Execution System (MES) functions along with analysis of different performance indicators (for example, consumption indices), it is possible to analyse the overall performance of the equipment based on the Overall Equipment Effectiveness (OEE) index. The OEE takes into account such factors as the equipment availability and performance, and quality of products.

However, the OEE usage often leads to optimisation of individual plant units or areas, resulting in lower overall economic efficiency, for example, due to the increase of unfinished production. In addition, OEE cannot calculate the economic benefit of producing a particular product type.

A way of increasing the efficiency of performance analysis could be the analysis of production losses, including time losses, performance losses, energy losses, and quality losses.

The next step after building a tentative system of indicators would be a thorough analysis of the source data in the information systems that exist at the enterprise. These systems accumulate large volumes of information about the products, including material consumption, cost of materials and utilities, non-

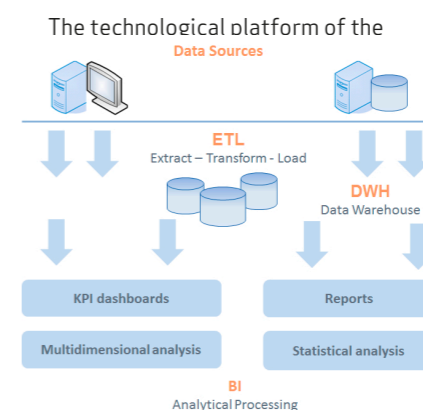
finished production, sales prices, rework expenses, and others. As the information in many cases is not integrated and kept in discrete information systems, the data are hard to analyse.

At this stage, the major problems are the following:

- Unavailability of data needed for calculation of indicators. The data were not entered on time or the measuring equipment was down.
- Contradictory data in different systems. One can get completely different answers to the same question.
- Unavailability of unified master data at the enterprise.
- Possibilities to edit data and hence manipulate the values of indicators.

After data analysis, the initial system of indicators can be revised and requirements developed for modification of the existing information systems or creation of new information systems. The rules to eliminate contradictions should be also developed before submitting the data to the monitoring system.

After an iterative approval, the system of indicators, and the existing data in the information systems are finalized, and specifications for the development of the IT part of the system of indicators are devised. A typical BI system can serve as an example of the system's architecture (Pic. 2).



system consists of business analysis tools, including IBM Cognos and SAP Business Objects, and data warehousing technologies. The Extract Transform Load (ETL) is used to extract from data sources (ERP and MES), to verify, and to load into the data warehouse the information required for analysis. Typically, the process is launched

automatically in specified time intervals or when a specific event occurs.

Theoretically, it is possible to not use a data warehouse, as its development is labor-intensive and requires highly qualified professionals. However, this may lead to the loss of the following advantages of the monitoring system:

- Improvement of data quality when loading data to the data warehouse
- Creation of a single source of consolidated and consistent information about the production processes
- Reduction of the load on transaction systems. For that purpose, the ETL processes are used for one-time data retrieval from the source systems instead of addressing the systems each time when data analysis is required
- Possibility to conduct historical analysis of performance indicators, including those received after organizational or technological changes
- Possibility to implement a single methodology of corporate management and production assessment for different departments.

Using modern tools of business analytics, it is possible to create indicator dashboards and different reports. When performance values fall outside the tolerable limits, notifications are sent by email or to a mobile device. As a result, managers are able to make grounded and timely decisions.

The ongoing monitoring, as well as the analysis of performance indicators and impacting factors enables organizations to improve their production effectiveness on a continuous basis. ■

Contact information

IBA Group
Email: info@ibagroupit.com
Tel: +420 251 116 206
Website: www.ibagroupit.com

IBA UK
Tel: +44 (0) 20 7969 2715
Email: info@ibagroupit.com