

Principles of managing development of EPM systems

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Abstract

At present, enterprise performance management (EPM) systems are widely used in practice, because they facilitate strategic decision-making and contribute to improved information transparency of organizations. However, methodological issues related to managing the development of such systems seem to be insufficiently investigated and elaborated.

The purpose of the study is to formulate and justify fundamental principles for managing EPM systems' development. These principles derive from peculiarities of EPM systems themselves and the features of their development management. In particular, the features of EPM systems are complexity and modular structure, large-scale scope, the long-term nature of planning, monitoring and analysis, use of aggregated information – both financial and non-financial. The features of managing development of EPM systems include the implicit nature of the resulting economic benefits, influence of stochastic factors, as well as availability of “complicated” projects (with uncertain outcomes, ability to re-execute and multiple variants of implementation).

As a result, the basic principles of managing development of EPM systems can be formulated. There are the principles of a system, the going concern, business alignment, value for money, program management, alternativeness, feasibility, stochasticity, as well as resources aggregation.

The significance of these principles is explained by the fact that they can be used as a basis for an integrated process of managing the development of EPM systems. These principles are also valuable for formalizing certain elements of the management process, such as assessment of the maturity level of EPM systems, the formation of potential development programs, simulation of implementation of the development programs, as well as decision-making regarding selection of development programs for implementation.

Key words: performance management; EPM system; development program; management principles; information system.

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Introduction

One of topical problems of management in enterprises and organizations of various industries is so-called the “strategic gap”. It occurs when a company establishes essential long-term goals, but conducts its current activities relying on short-term plans that are poorly related with both the goals and with each other [1, 2]. The reasons for such a situation may be classified into two groups – organizational and technological.

The organizational reasons include [1]:

- ◆ lack of strategic focus and inability to convey the essence of the strategy to employees;
- ◆ failure to follow and support the plan;
- ◆ inability to adapt to changes;
- ◆ ignoring non-financial and qualitative measures;
- ◆ lack of realistic forecasting when planning is based on the current state of the environment, without considering possible changes that may occur in the future.

The technological reasons are [1]:

- ◇ poor integration of the management system;
- ◇ over-reliance on enterprise resource planning (ERP) systems, when such systems are considered as the main and the only management instrument, applicable both on operational and strategic levels.

Besides the “strategic gap” problem, the following phenomena often take place in practice [3]:

- ◆ insufficient consistency of the system of strategies (including corporate strategy, busi-

ness strategies and functional strategies), the local nature of development planning;

- ◆ lack of goal orientation of day-to-day activities, existence of discrepancies between strategies and operating plans;
- ◆ insufficient flexibility and adaptability of strategies and plans, low responsiveness to changes;
- ◆ poor integration and effectiveness of the system of accounting, reporting and monitoring;
- ◆ insufficient information support of internal and external stakeholders, causing decision-making based on unreliable and irrelevant information.

The need to solve these problems and to eliminate their causes has led to the emergence of a special class of management systems – enterprise performance management (EPM) systems. They also are called corporate performance management (CPM) systems, business performance management (BPM) systems or simply performance management systems (PMS). Theoretical developments in this field are supported by leading international software vendors – Oracle, IBM, SAP, SAS, etc. At the same time, the EPM concept goes beyond information technologies: it also covers management methods and processes, as well as management personnel involved in these processes.

As a management system, an EPM system is also an object of management: the processes of the system’s design, implementation, maintenance and development should be properly managed. Accordingly, there is a question

regarding the methodological approach to the development of EPM systems. Existing works on EPM systems themselves [1–6] do not consider this point, because they are focused, first of all, on the aims and functionality of such systems.

An important role in determining aims of EPM systems belongs to international and local codes of corporate governance that establish requirements on information transparency of companies [7–10], as well as to proceedings in the field of strategic management [11–13]. However, the questions of managing development of EPM systems are also not considered in such documents and research works.

There are many works related to “methodological filling” of EPM systems, i.e. approaches, methods and models which are used within the performance management processes. In this regard, we may mention the works in the field of management by key performance indicators [14, 15], management accounting, planning and budgeting [16, 17], financial consolidation [18] and business analysis [19]. These proceedings are important for understanding certain components of EPM systems, but they also do not focus on the matters of their development.

In addition, many proceedings deal with certain aspects of information system development, for example, decision-making in the IT sphere [20], IT strategy [21, 22], IT project management [23], enterprise architecture [24]. These developments are quite important; they have significant value and may be applied in different stages of the EPM system development process. However, certain methodological issues discussed in these works are not completely integrated and do not take into account specific features of EPM systems.

Thus, existing developments, even considered in aggregate, do not provide a holistic

imagination regarding EPM systems development. Consequently, the aim of creating a holistic methodological approach to EPM systems development may be considered as topical. Such an approach should take into account the peculiarities of such systems and should allow managers to integrate methods and models that are essential at different stages of the management process.

For developing any methodological approach, it is necessary to start with the formulating principles on which this approach will rely. Examples of such principles are the principles of business processes re-engineering [25], principles of “beyond budgeting” [26], principles of preparation and presentation of financial statements [27] and some others. Thus, the aim of the research is to formulate relevant principles for managing the development of EPM systems. These principles should be based on the inherent peculiarities of managing EPM systems development. In turn, these peculiarities should derive from specific features of the EPM systems themselves. This logic explains the structure of the article: first, we examine specific features of EPM systems, then the peculiarities of their development management, and finally the principles of managing development of EPM systems¹.

1. Nature and peculiarities of EPM systems

There are different but interrelated definitions of an EPM system. In the most common sense, such a system covers “formal and informal mechanisms, processes, systems, and networks used by organizations for conveying the key objectives and goals elicited by management, for assisting the strategic process and ongoing management through analysis, planning, measurement, control, rewarding, and broadly managing performance, and

¹ Preliminary results of the research were presented at the XXII International Scientific Conference on Enterprise Engineering and Knowledge Management (EEKM–2019), Moscow, 25–26 April 2019

for supporting and facilitating organizational learning and change” [4]. One of the elements of the EPM conceptual model [4] is the information flows, systems and networks supporting the strategic level processes. Authors of the model argue that this element is similar to “the nervous system in the human body, transmitting information from the extremities to the center and from the center to the extremities” [4]. In addition, the difference between feedback and feed-forward information is highlighted: information flows of the first type are used “to enable the undertaking of corrective and/or adaptive courses of action,” while information of the second type is essential “to enable the organization to learn from its experience, to generate new ideas and to recreate strategies and plans” [4].

In some narrower sense, an EPM system may be considered as a comprehensive system for information support of corporate governance and strategic management. Such a system represents “a set of methods, processes, information systems and personnel skills, focused into the tasks of gathering, reconciliation, storage, analytical processing and presentation of information, which is critical for an organization’s information transparency and strategic decision-making performed by external and internal stakeholders” [3].

Finally, an EPM system may be considered as one of the classes of corporate information systems. In this regard, we may mention software developments of the largest international IT companies – Oracle, IBM, SAP, SAS and some others. Particularly, Oracle Corporation considers EPM as software making it possible “to help organizations plan, budget, forecast, and report on business performance, as well as consolidate and finalize financial results” [28]. This definition represents functionality of software used within an integrated EPM system.

In spite of some differences in treatments, some important features of EPM systems may

be highlighted. These peculiarities include:

- ◆ complexity and modular structure;
- ◆ large-scale scope;
- ◆ long-term horizons of planning, monitoring and analysis;
- ◆ using aggregated information;
- ◆ using both financial and non-financial information.

The complexity of an EPM system means that it includes not only appropriate software, but also certain management methods and processes, as well as management personnel involved in this processes. From the point of view of functionality, EPM systems deal with the tasks of strategic analysis, management by key performance indicators, corporate planning and budgeting, preparation and analysis of corporate statements. Moreover, for each of the tasks different software products may be applied.

From the point of view of the scope, an EPM system is a corporate level management system. It covers either the whole organization, or several organizations which form a large business segment or a group of companies. As a result, managers and specialists involved in the EPM processes are usually located in different departments, organizations and geographical points. In such conditions, management coherence is supported by information technologies: modern EPM systems are internet-based, in addition, there are tendencies to applying cloud technologies (the SaaS model).

Long-term horizons of planning, monitoring and analysis within EPM systems are explained by the role of such systems in overcoming the “strategic gap,” and by their role of a link between strategic and operational management levels. This distinguishes EPM systems from enterprise resources planning (ERP) systems, which are oriented to planning, accounting and analysis of detailed operations.

The strategic focus of EPM systems leads to the fact that such systems use aggregated information about the current position and activities of an organization. This is another difference between EPM and ERP systems, because the second deals with detailed information about individual operations.

Finally, one of the features of EPM systems is that they deal with not only financial, but also with non-financial information. In this regard, we may remember four strategic perspectives of the balanced scorecard methodology, where only one of them is “financial” [14]. Another example is related to modern models of corporate planning and budgeting, which include both financial and non-financial accounts.

2. Peculiarities of managing development of EPM systems

The foregoing specific features of EPM systems form the basis for determining peculiarities of their development management.

First, it should be noted that the economic benefits obtained by an organization as a result of implementing and developing EPM systems are implicit and cannot be reliably expressed in monetary terms. The fact is that EPM systems are oriented towards strategic and tactical decision-making that have a significant, but indirect impact on the state of an organization and the results of its activities. This makes it impossible to assess the efficiency of EPM system development using “classic” methods of investment appraisal, which are based on matching costs with economic benefits expressed in financial terms. In our case, the costs associated with the EPM system development may be measured (or estimated) in monetary terms, as in the case of traditional investment analysis. However, these costs should be matched not with any financial benefits, but with the dynam-

ics of the EPM system maturity, which is to be determined regarding pre-established threshold levels. This is an argument in favor of applying a model based on EPM maturity levels.

Another feature is related to the availability of stochastic factors influencing an EPM system development. This is explained by the large-scale nature of EPM systems, as well as the high level of complexity of the tasks performed. Influencing the stochastic factors is related not only with development projects (duration, time lags, consumption of resources), but also with their consequences (impact on EPM maturity, financial matters). As a result, the classic project management methods based on strict sequence of works and determined parameters seem inapplicable. Instead, it is reasonable to apply models which allow us to describe the stochastic parameters of the system’s development.

One more feature is that some of the development projects may be “complicated.” For examples, there are projects with uncertain outcomes, the possibility of reworking and the availability of a few possible variants of implementation [29]. Some of the characteristics of such projects (e.g. obtaining one or another result, or selecting one or another variant of implementation) are also represented by stochastic values. This, again, is an argument in favor applying stochastic models.

The set of aforementioned features forms the basis for formulating principles of managing EPM system development.

3. The principles of managing development of EPM systems

Let us consider the fundamental principles of managing EPM systems development. Some of them have been discussed in [30]. However, within the current study they were updated and significantly improved.

3.1. The principle of a system

The first and the most important principle of EPM systems development is the principle of a system. This means considering the object being examined as a holistic system which consists of certain components and interrelationships between them. It is also essential to take into account the linkages between the system and its external environment within which the system is operating and developing. The system's activities and its development should be considered in the context of the predefined aim that characterizes the role of the system and its purpose. Both the system as a whole, and each of its components should be considered dynamically, taking into account the system's states in the past, as well as the prospects for its development in the future.

An EPM system is an integrated object focused on information support of corporate governance and strategic management, that, in turn, contributes to developing the entire organization and achieving the established corporate goals. The EPM system operates within the organization, being one of the corporate level management systems. At the same time, the EPM system has an integrated nature: it consists of heterogeneous but inter-related components – methods of processing management information, management processes, organizational structures, management personnel, software. The components of the EPM system may also be classified according to their functions: among aggregative tasks performed by the system, we may identify strategic analysis, management by key performance indicators, corporate planning and budgeting, financial consolidation. All the elements of the EPM system change over time, both as a result of managerial impact on the system, and under the influence of its external environment.

3.2. The principle of the 'going concern'

The principle of the going concern is entirely consistent with the similar principle formulated in the International Standards of Financial Reporting [27]. This principle means assuming that an organization within which an EPM system is functioning and developing, conducts its activities on a regular basis, both at present and in the foreseeable future, having no intention to terminate or to reduce its operations. If the organization has plans to discontinue operations in some areas (for example, by selling some of its business segments) then development of management systems related to such segments should be considered separately from the management systems of the main organization (for example, in the context of pre-sale preparation of the respective assets).

3.3. The principle of business alignment

The principle of business alignment means that development of an EPM system should be related with the strategy of the whole organization, its mission, vision, strategic goals, as well as policy in the field of corporate governance. This is explained by the fact that corporate governance and strategic management are sources of significant requirements for information support of management processes which are implemented with the help of EPM systems. A typical example is the company's intention to offer its shares on an international stock exchange, which means the need to comply with foreign corporate legislation and, consequently, increased requirements for the company's controllability and information transparency.

Therefore, target orientation of the EPM system development is essential: there is a certain target state of the system that meets information requirements of corporate gov-

ernance and strategic management and takes into account the interests of different groups of stakeholders. The target state of the system should be described regarding the time axis, since properties that are not essential at the moment may be vital in the future. Therefore, the EPM system development management should be targeted at filling the gap between its current and target states.

It is allowed to use multiple variants of the system's target states. For example, there may be some "satisfactory" maturity level of the system that meets the most important requirements, and an "advanced" level, the achievement of which means that the system meets all the requirements, without any exception.

Also, there is a feedback between strategic management and the development of EPM systems: certain aspects of the development process should be reflected in functional strategies of the organization, in particular, in the IT and human resources strategies.

3.4. The principle of value for money

The "value for money" (VfM) concept represents an approach to evaluating the efficiency of the resources used. It is widely used in those areas where the return on investments cannot be measured reliably in monetary terms – in public administration, politics, culture, sports, the social sphere. In our case, the principle of value for money follows from the implicit nature of the economic benefits obtained from the EPM systems' implementation and development. Instead, the positive dynamics of the system's maturity level, calculated relying on predefined thresholds, is to be considered as the return on investments.

Maturity models are quite often used in practice. In particular, at different times they have been proposed for software development processes [31], the tasks of control

objectives for information and related technology (COBIT) [32], business intelligence systems [33], solutions for big data analysis [34], IT governance [35], enterprise architecture [36, 37], service-oriented architecture [38], analysis of IT and business alignment [39]. A similar model has also been developed for enterprise performance management systems [40].

According to the value for money principle, EPM system development is considered, on the one hand – from the point of view of increasing its maturity, and on the other hand – regarding resources consumed during the development process.

3.5. The principle of program management

The principle of program management means that the system's development is carried out through interrelated projects which in aggregate form the development program. Herewith, continuous (rolling) planning may be applied: the program is revised and updated on a regular basis, by adding some further planning period and deducting the earliest one. The amendments may concern both local characteristics of the development program (for example, the timing of individual projects) and the fundamental framework of the entire system. In this connection, both the EPM system itself and its external environment should be considered in dynamics.

3.6. The principle of alternativeness

The principle of alternativeness means forming potential (alternative) development programs and subsequently selecting one of them on a competitive basis. Meanwhile, forming the potential programs is executed on the basis of pre-agreed requirements, taking into account both compliance with the business and the limits of financing.

Selecting one of the programs for practical implementation is performed on the basis of a comprehensive consideration of all the alternatives, taking into account not only quantitative indicators, but also qualitative factors. Consequently, it is reasonable to use an expert approach for decision-making support.

3.7. The principle of feasibility

According to the principle of feasibility, it is essential that only development programs that are likely to be successfully implemented are to be considered as potential alternatives. First of all, we mean resources (financial, technical, human, etc.) that are necessary for implementing projects of a development program. In addition, the timeframes of the project's implementation should be consistent with the nature and complexity of the tasks executed. In some cases, it is also necessary to take into account conditions of the external environment – factors of an economic, legal and organizational nature.

To assess development programs' feasibility, a special analysis (feasibility study) is performed. It includes setting up appropriate criteria and evaluation of all the programs concerning these criteria, usually with the help of experts. If the investigated program does not meet at least several criteria, it cannot be considered realistic and is likely to fail.

3.8. The principle of stochasticity

The principle of stochasticity means that within the analysis of development programs it is essential to take into account random factors. Such factors, first of all, are related to the characteristics of projects included in development programs – both the timeframes of their implementation and the volumes of resources consumed. In addition, stochas-

ticity concerns the project's impact on the system's maturity level – both regarding the power of impact and time lags between completion of projects and changes in the system's maturity.

Random factors can be taken into account by simulating multiple scenarios of the development program's implementation. This allows us to collect the appropriate statistics and, relying on it, make conclusions regarding characteristics of the program. For solving this task, it seems reasonable to apply special simulation information systems. The results of the simulation represent the basis for comparing alternative development programs and final decision-making regarding practical implementation of one of them.

3.9. The principle of resources aggregation

The principle of resources aggregation means that resources involved in the project's implementation should not be considered in a breakdown by their individual types. Instead, we should use the aggregated values of the resources expressed in monetary terms (the amounts of payments associated with the projects). Moreover, in accordance with the principle of stochasticity, the financial estimates of the resources are to be considered as random values. Such estimations may be determined either relying on existing historical data, or with the help of expertise. It is also assumed that all the resources are available at the right time.

The principle of resources aggregation is applied to the development program as a whole and does not mean ignoring detailed resources planning on the levels of certain projects, their stages and detailed works.

Relying on the aggregated estimates of resources, financial indicators of the development program are formed. They are taken into account while evaluating and selecting a development program for implementation.

Conclusion

Enterprise performance management systems have certain intrinsic features that distinguish them from other types of corporate management systems. These properties, in turn, explain the specifics of managing the development of EPM systems. Relying on these peculiarities, the fundamental principles for managing EPM system development have been formulated. The role of such principles is that they represent the basis for an integrated methodology for managing the EPM system development process.

The following areas of further research may be indicated:

- ◆ determining the main stages of managing

the EPM systems development process;

- ◆ creating an approach to forming info-logical models of EPM systems and their components;

- ◆ developing a methodology for estimating the system's maturity;

- ◆ formulating recommendations in the field of simulation modeling of EPM development programs;

- ◆ decision-making justification regarding selection of one of the potential programs for practical implementation.

Integration of the aforementioned methods and models allows us to develop a holistic methodology of managing the development of EPM systems. ■

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