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DIAGNOSING THE MATURITY LEVEL OF IT PROCESSES AT THE ENTERPRISE

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Skrynkovskyy R. M. Diagnosing the Maturity Level of IT Processes at the Enterprise

The article is aimed at substantiating theoretical provisions and developing practical recommendations to improve diagnostics of the maturity level of IT processes at the enterprise. It is determined that today at any enterprise using information systems and technologies (in the spheres of management, administration and IT law), business goals cannot be achieved without achieving IT goals, and IT goals, accordingly, cannot be achieved without the optimal maturity level of IT processes. It is determined that diagnostics of the maturity level of IT processes at the enterprise is the process of identification, analysis and estimation of the level of performance of IT processes in the field of IT management (taking account of the risk assessment inherent in IT) with the purpose of making reasonable managerial decisions directed on achievement of desirable result of activity of enterprise in the systems of «effect – result», «goal – means – result» and «data – information – knowledge».

Keywords: enterprise, information systems and technologies, IT processes, business goals, management and administration, Standard of CobiT®4.1, diagnostics. **Fig.:** 4. **Formulae:** 3. **Bibl.:** 28.

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Скриньковський Р. М. Діагностика рівня зрілості ІТ-процесів на підприємстві

Метою статті є обґрунтування теоретичних положень та розроблення практичних рекомендацій з удосконалення діагностики рівня зрілості ІТ-процесів на підприємстві. Встановлено, що сьогодні на будь-якому підприємстві, яке використовує інформаційні системи та технології (у сферах управління та адміністрування й ІТ-права), бізнес-цілі не можуть бути досягнуті без досягнення цілей ІТ, а ІТ-цілі, відповідно, не можуть бути досягнуті без оптимального рівня зрілості ІТ-процесів. Визначено, що діагностика рівня зрілості ІТ-процесів на підприємстві – це процес ідентифікації, аналізу й оцінювання рівня результативності ІТ-процесів у сфері управління ІТ (з урахуванням оцінки ризиків, притаманних ІТ) з метою прийняття обґрунтованих управлінських рішень, що спрямовані на досягнення бажаного результату діяльності підприємства в системах «ефект – результат», «ціль – засіб – результат» та «дані – інформація – знання».

Ключові слова: підприємство, інформаційні системи та технології, ІТ-процеси, бізнес-цілі, управління та адміністрування, стандарт CobiT®4.1, діагностика.

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Скриньковский Р. Н. Диагностика уровня зрелости ИТ-процессов на предприятии

Целью статьи является обоснование теоретических положений и разработка практических рекомендаций по совершенствованию диагностики уровня зрелости ИТ-процессов на предприятии. Установлено, что сегодня на любом предприятии, использующем информационные системы и технологии (в сферах управления и администрирования и ИТ-права), бизнес-цели не могут быть достигнуты без достижения целей ИТ, а ИТ-цели, соответственно, не могут быть достигнуты без оптимального уровня зрелости ИТ-процессов. Определено, что диагностика уровня зрелости ИТ-процессов на предприятии – это процесс идентификации, анализа и оценки уровня результативности ИТ-процессов в области управления ИТ (с учетом оценки рисков, присущих ИТ) с целью принятия обоснованных управленческих решений, направленных на достижение желаемого результата деятельности предприятия в системах «эффект – результат», «цель – средство – результат» и «данные – информация – знания».

Ключевые слова: предприятие, информационные системы и технологии, ИТ-процессы, бизнес-цели, управление и администрирование, стандарт CobiT®4.1, диагностика.

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The modern practice of doing business in Ukraine proves that nowadays information technologies and created on their basis special integrated information systems used in management systems become an irreplaceable tool in achieving strategic goals and sustainable development of enterprises. In such circum-

stances, measuring the level of effectiveness of IT processes in an enterprise is quite relevant and important.

Results of the analysis of the data presented in the literature sources [1–27] indicate that certain problems (aspects) in the sphere of development (formation), use, and development of IT processes in enterprises (in

the context of management and administration, and IT law) were investigated by such scientists and experts as T. Bachynskyi, P. Herasym, V. Huzhva, O. Zaritskyi, V. Zaiats, S. Lobov, A. Pohorilyi, S. Telenyk, O. Tomashivskyi, E. Humphreys, C. Shannon, and others. But, alongside with recognizing their significant scientific and practical contribution to the research and development of certain aspects of the problem, it should be noted that insufficient attention is paid to diagnosing the level of maturity of IT processes in an enterprise. All this has determined the relevance of the presented research, defined its theme, aim and objectives.

The *aim* of the article is substantiating theoretical provisions and developing practical recommendations to improve diagnosing the level of maturity of IT processes in an enterprise.

Achievement of the set goal has necessitated the resolution of such scientific problems as:

1) clarifying the essence of the category of “management information system” and presenting the main components of the standard structure of an information system;

2) proposing a list of general functions for managing the functional subsystem of typical information system structures;

3) identifying the relationship between business goals (enterprise goals), IT objectives and IT processes, and consider the system of IT processes in accordance with CobiT®4.1 (IT Governance Institute, 2007);

4) developing recommendations to improve diagnosing the level of maturity of IT processes in an enterprise (in the context of management and administration and IT law).

Based on the analysis of the data presented in the literature on the problem [1–27], it is established that

1. A management information system (MIS) should be considered as a set of organizational and technical means (or technical means of data processing, software, and relevant personnel) for the collection, transmission, processing and storage of information for a certain level of management (strategic, tactical, operational) for the purpose of providing information needs of users (controlling (subject) and controlled (object) systems) [2, p. 4–5; 4, p. 100; 18].

2. The main components of the typical IS structure are:

- ✦ functional components (functional subsystems (modules, business applications), functional tasks, models and algorithms that determine and / or ensure the performance of the system of management functions);
- ✦ components of the data processing system (information support, software (system-wide, special), technical support, legal support, linguistic support, etc.);

- ✦ organizational components (new organizational structure of the enterprise, personnel (staffing schedule, job descriptions, etc.) [2, p. 28].

3. It is recommended to select the composition of the functional tasks of the functional management subsystems taking into account such generic management functions as [2, p. 31; 18; 20, p. 102; 28]:

- ✦ control;
- ✦ planning, based on the main goal;
- ✦ action (organization and execution);
- ✦ coordination and corrective actions (regulation);
- ✦ accounting system (including: business accounting, statistical, operational and technical, and management accounting);
- ✦ diagnostics (technical, economic, legal) with such sub-functions as identification of the state and capabilities; reasoning-based analysis; assessment of the state, trends, and prospects for development.

4. Today, at any enterprise that uses ISs and technologies (in the spheres of management, marketing, finance, accounting, innovation, and training, at the intersection of branches of law and IT, etc.), business goals (driving factors of corporate governance, business outcomes) cannot be achieved without achieving IT goals, and, accordingly, IT goals cannot be achieved without achieving the optimal level of maturity of IT processes. In IT governance the maturity of IT processes indicates the maturity of specific IT functions (solving functional tasks of IS) [14; 25]. In the focus of IT governance are:

- ✦ coherence with the strategy;
- ✦ ensuring value;
- ✦ managing resources;
- ✦ managing risks;
- ✦ assessing efficiency, etc. [23–26].

5. According to the balanced system of business indicators (indicators, parameters) by R. Kaplan and D. Norton (Balanced Scorecard — BSC) [6; 9, p. 57], it is possible to single out such business goals of strategic management in an enterprise (within the four projections of the BSC: finance, clients, internal business processes, training and career growth) as

- ✦ goals related to financial prospects (the value of business investment for stakeholders, portfolio of competitive products and services, business risk management, compliance with laws and regulations, financial transparency);
- ✦ goals related to customer prospects (customer-oriented service culture, continuity and availability of business services, flexible responses to changing (complex, multifaceted, dynamic, and uncertain) business environment, information based on strategic decisions, optimization of service costs);
- ✦ goals related to internal prospects (optimization of business process functionality, optimization of expenses on business processes, business

change programs, operational productivity and staff productivity);

- ✦ goals related to training and growth (compliance with internal policies, qualified and motivated people, culture of business innovation and new products) [14].

6. The basis of any process, including an IT process, is a certain (specific) technology, the components of which are:

- ✦ the purpose of the process implementation;
- ✦ the object subject to technological changes;
- ✦ techniques and methods of impact;
- ✦ means of technological impact;
- ✦ order and organization opposed to spontaneous processes [20, p. 6].

7. Modern computer information technologies are based on artificial intelligence systems, which can be conditionally divided into the following 3 groups:

- ✦ intelligent information retrieval systems;
- ✦ computing and logical systems;
- ✦ expert systems [5, p. 287].

8. CobiT® [1] (IT Governance Institute, 2007) notes that IT processes should be grouped into the following interrelated spheres of activity (or IT responsibilities):

- ✦ plan and organize (PO);
- ✦ acquire and implement (AI);
- ✦ deliver and support (DS)
- ✦ monitor and evaluate (ME) (Fig. 1) [7, p. 147–148; 25].

At the same time, it has been established that effective IT governance contributes to achieving business goals of strategic management of enterprise activities, optimization of IT investments and, accordingly, allows to optimally manage risks and opportunities related to IT. Diagnostics of IT processes is a key component of process management [25].

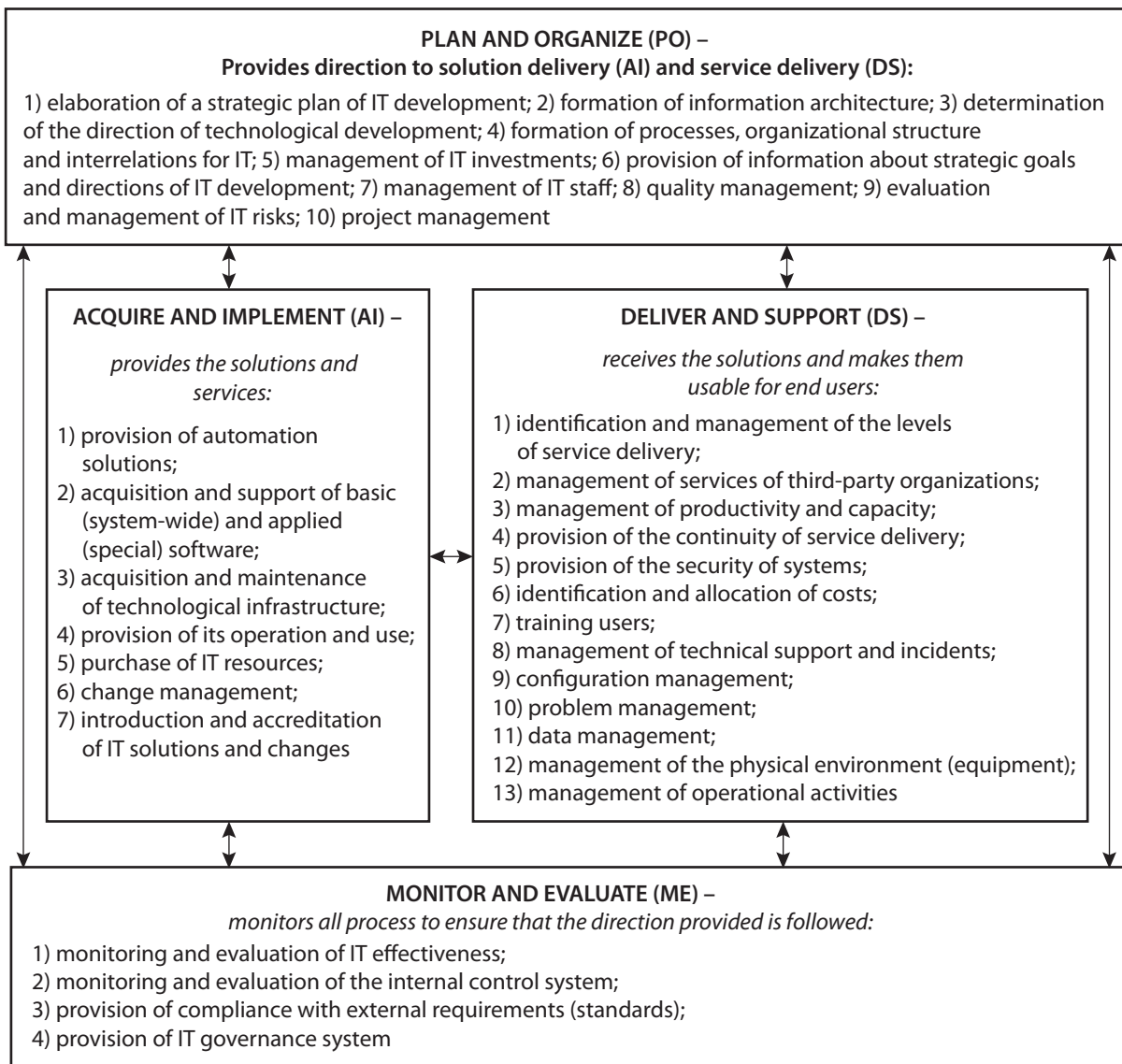


Fig. 1. The system of IT processes (according to CobiT® 4.1)

Source: [7, p. 147–148; 25] (Materials of IT Governance Institute).

Thus, diagnosing the level of maturity of IT processes in an enterprise is the process of identifying, analyzing and evaluating the level of IT process performance in the field of IT governance (taking into account risks inherent in IT) in order to make well-founded management decisions (concerning functioning, development) directed to achieve the desired (necessary) result of the enterprise's performance in the systems "effect-result", "goal-means-result" and "data-information-knowledge" [14; 25], based on:

1) the metric of defining the constant of "result" (in economic studies) (Fig. 2) and the economic and mathematical model (the system of equations) to determine the performance result presented by the formula (1):

$$|R| = \begin{cases} f(R^+) = \sum_{i=1}^n t_i \cdot E_i^+ \cdot p_i, & \text{with } E_i > 0 \\ f(R^-) = \sum_{j=1}^m t_j \cdot E_j^- \cdot p_j, & \text{with } E_j < 0 \\ f(R^0) = \sum_{e=1}^k t_e \cdot E_e^0 \cdot p_e, & \text{with } E_e = 0 \end{cases} \quad (1)$$

$$1 = \sum_{i=1}^n t_i + \sum_{j=1}^m t_j + \sum_{e=1}^k t_e,$$

with $t_i \geq 0, t_j \geq 0, t_e \geq 0$ $\sum_{i=1}^{n+m+k} p_i = 1,$

where R – the performance result; E_i^+ and E_j^- – positive and negative economic effects; E_e^0 – uncertain economic effects, that is, the implementation of economic risks (perceived and unperceived ones); t_p, t_j and t_e – target-based coefficients; p_i – probability of implementing a certain type of economic effect [11, p. 23];

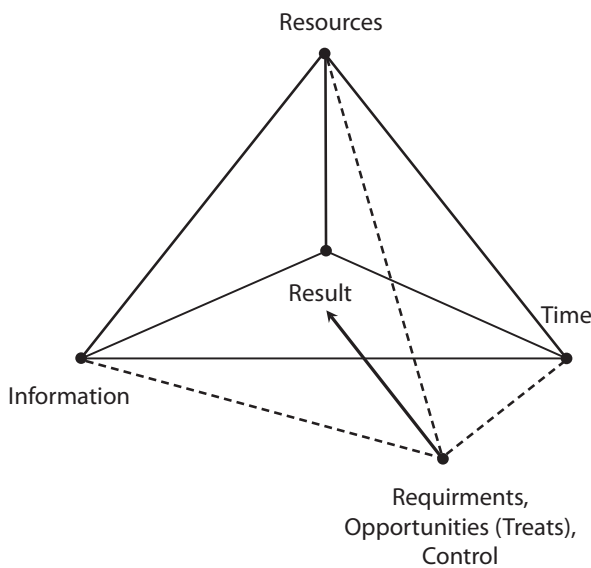


Fig. 2. The metric of defining the constant of "result" in economic studies

Source: improved based on [1; 11, p. 25; 17].

2) a four-dimensional model for evaluating the performance of business processes in an enterprise (Fig. 3) by nature of result formation (basic, supporting ones, business management process, and business development processes [3]) and the economic and mathematical model for assessing the level of quality of enterprise development presented by the formula (2):

$$Q_{DR} = \sqrt{D \cdot R} = \sqrt{\frac{P_1(1 - P_n)}{P_1} \cdot \frac{\sum_{i=1}^t P_{1i}^{\min}}{100\%}}, \quad (2)$$

where Q_{DR} – the level of quality of the enterprise's development; D – the coefficient of zero defect production; R – the coefficient of smooth production flow; P_1 – the volume of marketable products; P_n – the share (specific weight) of defective products in the marketable products; $i = 1 \dots t$ – the number of periods in a year, by which the comparison of planned and actual volumes of production is carried out; $P_{1i}^{\min}, \%$ – the minimum share of marketable products as compared to the annual equivalent between the planned production program and the actual one [9, p. 274–275].

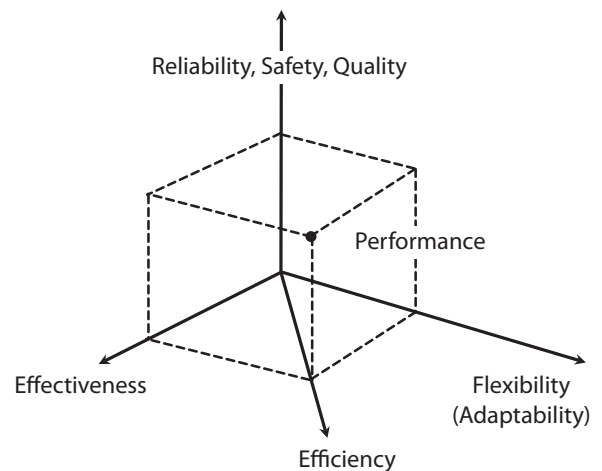


Fig. 3. The four-dimensional model for evaluating the performance of business processes in an enterprise

Source: improved based on [12, p. 170; 16; 21; 25].

In this context, special attention should be paid to the scientific work by A. Melnik [9], which states that enterprise development as a category (concept) can be viewed from several perspectives, namely: development as a result, development as a process, development as dynamics, development as regularity, development as a property [9, p. 261];

3) the model of IT process maturity (in three dimensions: capability, coverage and control) and that of a comprehensive system for controlling IT processes in an enterprise (Fig. 4) [25] (in the system of organization of work and production), with consideration for:

- ✦ the "golden rule of enterprise economy" presented by the formula (3);

- ✦ the features, place and roles of IT law (arising from the state of the IT market) at the intersection of the branches: law, management and IT.

$$T_1 > T_2 > T_3 > 100\%, \quad (3)$$

where T_1 – the rate of increase (decrease) in profit; T_2 – the rate of increase (decrease) in sales volume; T_3 – the rate of increase (decrease) in the value of assets (the balance sheet total) [8, p. 139].

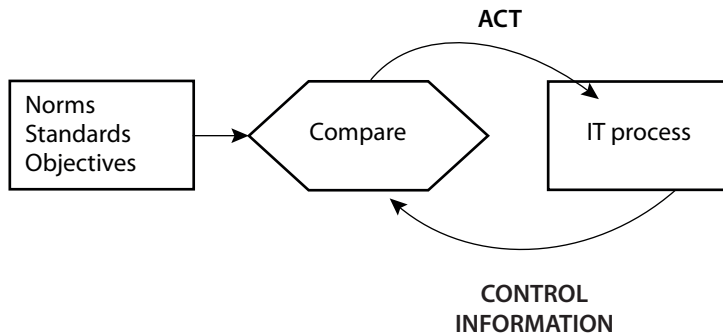


Fig. 4. The model for controlling IT process in an enterprise (according to CobIT® 4.1)

Source: [25] (Materials of IT Governance Institute).

Taking into account the above mentioned, it is also worth noting that IT law is a new round of jurisprudence to solve practical problems related to: 1) the sphere of legal regulation of information relations, innovations, technology transfer; 2) e-commerce and trade; 3) electronic document management, structure of contracts and features of taxation in IT; 4) information security and information protection in IT; 5) security and protection of intellectual property rights in IT; 6) cybersecurity, cybercrime [16; 21] and legal liability for violation of IT law, etc. [13; 27].

At the same time, it was found that a competently designed and built IT infrastructure creates a number of advantages for business (enterprises), the main of which are: 1) increase of profitability; 2) optimization of expenses (fixed, variable); 3) increase of efficiency and performance of business processes and goal-directed technological processes (automatic processes, programmable technologies, vocational technologies, scientific and technical technologies, scientific research technologies, chaotic processes [20, p.6]) [19].

Pabulum for reflection: at the World Economic Forum-2018 (Davos, Switzerland), within the framework of the forum of young leaders of Global Shapers Community, Ma Yun, the richest man in China, said: "If we do not change the way we teach, 30 years from now we're going to be in trouble. The knowledge-based approach... would "fail our kids", who would never be able to compete with machines. Children should be taught "soft skills" like independent thinking, values and team-work. All we learn must differ from the skills of machines ..." [10].

CONCLUSIONS

The analysis of the data presented in the literature [1–27] and the results of the studies show:

1. Today, at any enterprise that uses information systems and technologies (in the spheres of management, marketing, finance, accounting, innovation, training, at the intersection of law and IT, etc.), business goals cannot be achieved without achieving IT goals, and IT goals,

respectively, cannot be achieved without achieving the optimal level of maturity of IT processes.

2. Diagnosing the level of maturity of IT processes in an enterprise is the process of identifying, analyzing and evaluating the level of IT process performance in the field of IT governance (taking into account the risks inherent in IT) in order to make well-founded management decisions aimed at achieving the desired (necessary) result of the enterprise's activity in the systems "effect – result", "goal – means – result" and "data – information – knowledge" based on:

- ✦ the main analytical dependencies revealing the effectiveness of the performance in the system of result "information-resources-time-requirements, opportunities (threats), control");
- ✦ the models for determining the performance of business processes in an enterprise (in four dimensions: effectiveness, profitability, flexibility (adaptability), reliability, safety, quality) and the economic and mathematical model for assessing the level of quality of enterprise development (for such indicators as: zero defects and smooth production flow);
- ✦ the model of IT process maturity (in three dimensions: capability, coverage and control) and that of a comprehensive system for monitoring IT processes in an enterprise (in the system of organization of work and production), taking into account the "golden rule of enterprise economy"; features, place and role of IT law (arising from the state of the IT market) at the intersection of the branches: law, management and administration, and IT.

3. Using information systems and technologies in enterprise management will “kill” part of jobs, but they will not be as wise as people who can find the right solutions in this direction.

The prospect for further research in this direction is improving the system of subgoals of economic diagnostics of an enterprise (pursues diagnosing its specific elements, spheres and activities), taking into account the presented research results. ■

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