

Development of an Information Management System for it Enterprise's Intellectual Potential

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Abstract: The current requirements of the IT market to the speed of decision-making, the high degree of innovation in end products, and the rapid development of technology necessitate the consideration of a system for managing the intellectual potential of employees that would contribute to the formation of competitive advantages, innovation activity support, and intensive knowledge sharing. The purpose of the article is to develop practical approaches to the assessment of intellectual potential and knowledge management and offer organizational changes and platform to implement information management system for IT enterprise's intellectual potential. Considering influence factors and assessment criteria of information potential, the article provides the results of assessment of intellectual potential of an IT enterprise. Assessment of knowledge management system demonstrates the readiness of staff to organize effectively intellectual assets and showed operational areas for improvement. Constancy of qualified personnel, innovative activity, implementation of inventions, professional training and other indicators allowed measuring the effectiveness of the IT enterprise's intellectual potential. Such an assessment will enable the IT enterprise to understand the current state of its intellectual assets and the ways to improve intellectual capital. Based on the results obtained, a prototype of an information system and organizational structure was formed to better manage the intellectual capital of an IT enterprise.

1 INTRODUCTION

Well-organized and properly maintained intellectual potential (IP) management of an IT enterprise allows a company to stay sustainable and productive, create value, and meet organizational goals. The activities of an IT company are inextricably linked to intellectual innovation, which produces information results based on knowledge. It is of great importance that intellectual assets, which contain an enterprise's employee knowledge, skills, training programs or any proprietary information that may provide the company with a competitive advantage, should be organized appropriately. The purpose of the study is to analyze theoretical and practical aspects of IT enterprise's intellectual potential management, and

develop the prototype of an information management system of IT enterprise's intellectual potential with a preliminary theoretical substantiation and empirical study of the effectiveness of the existing systems at the enterprise under research.

2 THE CONCEPT OF AN ENTERPRISE'S INTELLECTUAL POTENTIAL

Software enterprises in particular face a huge challenge complicated by the need to align the rapidly evolving technologies with the business objectives. The intellectual potential is the main intangible

resource that contributes to the effective development of the enterprise. Nowadays many Ukrainian and foreign scientists pay a lot of attention to the category of intellectual potential of an enterprise and its structural components.

Defining the intellectual potential of a company (or enterprise), foreign economists Stewart T., Edvinsson L., Swibee K., Petty R., and Guthrie J. identify knowledge as a source of additional competitive advantages. They assumed that the intellectual potential of the company represents the scope of the new knowledge, which it can use to enhance its competitive ability [11]. Shepelenko S.M. determined the intellectual potential as The author notes that intellectual potential includes intangible assets, such as knowledge, human capital, information technology, relationships with customers and partners, which are an important resource for creating value and ensuring the successful development of an enterprise [10].

J. Džino, B. Latinović, and Z. Avramović provided the example of how structural knowledge bases enhance decision-making processes in monitoring on the IT enterprise activity [6]. O. Sobko and S. Stakhurska defined intellectual potential as “..an opportunity to create intellectual added value by setting up the production and commercialization of intellectual-intensive products, which ensures innovative business development” [7]. Many other scientists also identify knowledge, results of intellectual labour, and creative abilities of employees among the defining features of an enterprise's intellectual potential. This is especially true for an IT enterprise, especially a product company, since the success of the application of such IP directly determines the performance and market success of such a business.

Many different approaches to the concept of IP rely on its structure. Thus, the most widespread general approach to the defining intellectual potential is its division into structural, information, human and relationship potential (Table 1).

Each approach reflects the specifics of human resources, corporate resources, and relationships with stakeholders, which are sources of additional knowledge value for the enterprise. The multifaceted characteristic of human potential contributes to the expansion of sources of innovative ideas, the development of various skills and the formation of organizational knowledge.

Yemialyanau A. states that the concept of intellectual potential is similar to the concept of intellectual capital, but if elements of intellectual capital are involved in the activities of the enterprise

and bring in income, then the elements of intellectual potential are not fully involved in the enterprise's activities and at a certain point in time do not bring income, but have the ability to bring it in the future [1].

Table 1.: Structure of intellectual potential (based on [2, 3, 7, 9]).

Intellectual potential	Structural potential	Includes officially recorded knowledge, legally protected in patents and trademarks, resources represented by software and formal processes, and the knowledge recorded in instructions, manuals, and other written forms.
	Information potential	Represents the value of information resources specific to the enterprise, including databases, data intelligence systems and management information technologies provided for informed decision-making.
	Human potential	Indicates the level of education, professionalism, qualification, skills, workers' innovation culture, critical thinking, creativity, and self-development, reflected in the company's capacity to remain current, advance and generate value-added assets.
	Relationship potential	Indicates the capacity to establish a direct connection with the market, encompassing relations with suppliers, contractors, and partners, and the strength of customer loyalty as the key determinants of a business's current and future potential for generating revenue and strengthening the brand.

Taking into account the parallels and importance for the enterprise, both concepts ensure the achievement of ultimate goals and the leveraging of intangible and human resources.

There are factors which affect intellectual potential development of the enterprise, both negatively and positively, restrain or push the growth of the enterprise's development. They relate to innovation and intellectual work at the IT enterprise, internal resources, financial opportunities, innovation activity, research & development initiatives, qualitative characteristics of labor resources. Each of the factors play an important role consequently in fostering or impeding IP progress within the domain. We highlight the following factors that will stimulate and constrain the development of IP for the IT enterprise (Table 2):

Table 2: Factors influencing on the development of intellectual potential¹.

Factors influencing on the IP development	
1) stimulate development	2) restrain development
<ul style="list-style-type: none"> • -available intellectual property rights; • -high profitability; • -high-quality scientific and technical developments; • -qualitative and clear approaches to the IP assessment; • -innovation and intellectualization of output products; • -highly qualified staff. 	<ul style="list-style-type: none"> • -lack of intellectual property rights; • -insufficient investment; • -lack of scientific and technical developments; • -lack of assessment of intellectual potential; • -insufficient level of specialists' experience.

3 ASSESSMENT OF KNOWLEDGE MANAGEMENT

Knowledge management is important for building intellectual capacity and the factors that contribute to its development. Knowledge management software facilitates the organization of information flows, enhances customer support, and fosters the development and preservation of intellectual potential. To assess the efficacy of the installed knowledge base, a survey (n=50) was conducted on a small IT enterprise to determine the qualitative possibilities of forming the knowledge base of the enterprise's IP. The nine parameters were selected based on their relevance to the research object. Depending on the level of familiarity with the knowledge management system (KMS), respondents were divided into three categories (advanced, intermediate, and introductory levels). Considering the experience of using the KMS, respondents used a 5-point Likert scale (strongly agree, agree, undecided, disagree, strongly disagree). The average values of each parameter according to the status of the respondents are depicted (Fig.1).

The results of our study of existing KMS indicated a high quality of knowledge existing in the enterprise (admitted by 52% of respondents), accurate knowledge captured in the enterprise (62% of respondents). According to the average value, the lowest values were given to the parameters “KMS has increased innovation in procedures”, “KMS is user friendly”, and “KMS provides development of knowledge”. This suggests that the KMS is not operating effectively in certain respects and may

require enhancement or replacement with a more efficacious alternative.

It is worth noting that the assessment of experienced users seems to be more positive, in particular with regard to the high level of knowledge accuracy, search quality and prospects for the development of the KMS. Nevertheless, experienced users note that the KMS does not have a sufficient impact on innovation and is not sufficiently embedded in their responsibilities. All categories agreed that a knowledge management system is essential to the success of an IT enterprise.

4 INTELLECTUAL POTENTIAL ASSESSMENT

In addition to the analysis of KMS efficiency, it is essential to examine the effectiveness of intellectual potential management within the enterprise. This entails a detailed investigation of intellectual capital and knowledge management systems, which represent two pivotal aspects of intellectual potential. We have applied the method of integrated assessment of intellectual potential by using the methods of expert survey and mathematical statistics.

The system of indicators consists of the following coefficients:

- coefficient of qualified personnel constancy;
- coefficient of innovative activity;
- coefficient of implementation of inventions (offers);
- coefficient of staff coverage by professional training;
- coefficient of engineering, technical and scientific support;
- coefficient of education level of personnel .

The indicators were selected taking into account the contribution of personnel qualitative characteristics, innovation activity and efficiency, scientific support of the company's current activities, trainings and professional training programs, etc. For the IT sector, acquiring new knowledge and honing practical skills is important given the rapid changes in technology and stakeholder requirements.

The survey was conducted among the managers, and the weight of each factor was determined. The consistency of expert opinion on each component indicator of intellectual potential was evaluated using the coefficient of variation. After normalization, the integrated indicator of the enterprise's intellectual potential was determined (Table 3).

¹ developed by authors

² based on 4, 8, 11

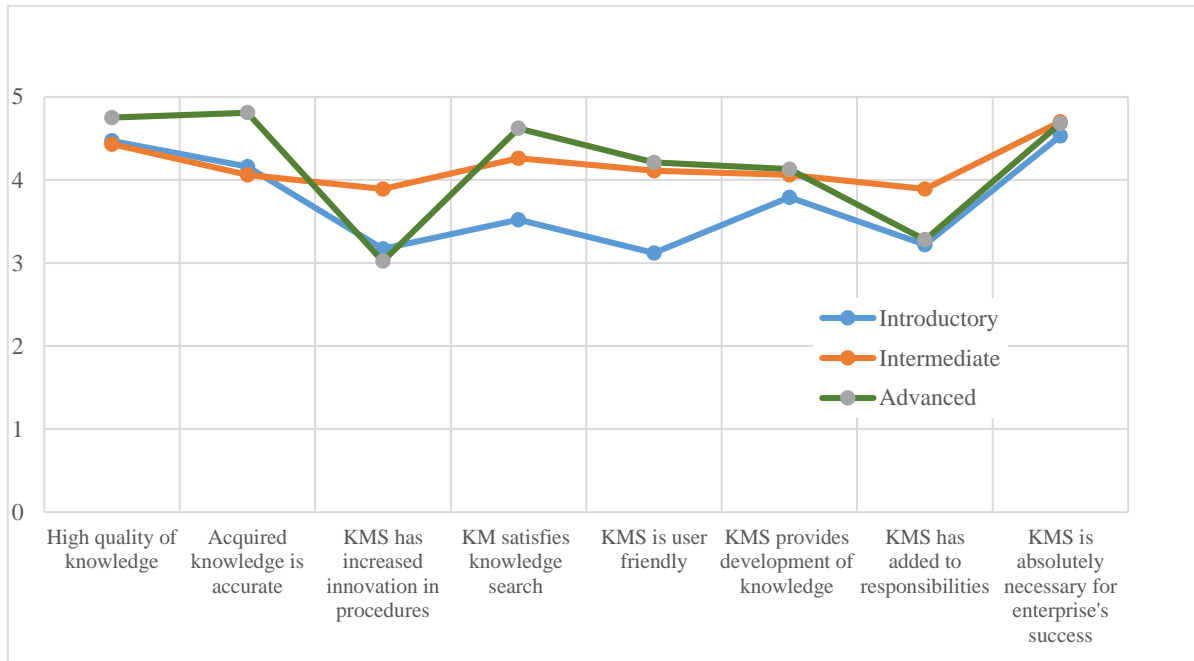


Figure 1: Qualitative estimate of KM system, by acknowledgement level ³.

Table 3: Expert assessment and determination of consistency of experts' opinions on partial indicators of intellectual potential ⁴.

Indicators	Average (χ_k, ω_k)	Standard deviation (S_k)	Coefficient of variation (V_k)
Coefficient of qualified personnel constancy	0,23	0,0136	5,92
Coefficient of innovative activity	0,16	0,0346	22,06
Coefficient of implementation of inventions (innovation offers)	0,17	0,0242	14,38
Coefficient of staff coverage by professional training	0,20	0,0140	7,07
Coefficient of engineering, technical and scientific support	0,12	0,0199	16,05
Coefficient of education level of personnel	0,12	0,0368	29,69

The coefficient of qualified personnel constancy is considered to be the most significant one (0,23), and the coefficients of engineering, technical and scientific support and educational level of personnel have the minimum specific weight (0,12).

Given the concordance coefficient $W=0,721$ and checked it by the Pearson's chi-squared test ($\chi^2=36,057$), it is higher than the tabular value of χ^2 ($p = 0,05; k = 4 - 1 = 3$), which is equal to 11,07, while the multiple rank correlation coefficient exceeds the mark of 0,7. It leads to the conclusion about the reliability of the data obtained by experts, and the feasibility of their further use for analytical purposes. The obtained results showed the increasing the level of motivation of skilled workers and stimulating creative initiatives of staff to improve the intellectual potential of the IT enterprise.

The overall assessment of the IP in terms of its structural indicators was carried out based on a qualitative study in accordance with the structural, human and user components. The number of indicators selected for the respective components was estimated based on the results of the survey, and the corresponding average scale values and ranks were obtained. In the top eight most useful indicators we observe seven indicators that are currently used (Table 4).

^{3, 4} developed by authors

Table 4: Estimated results of survey: all indicators ⁵.

All Indicators	Category	Average Value	Current Use Ranking	Usefulness Ranking
Customer satisfaction	Customer	4,78	4	1
Employee motivation	Human	4,62	7	2
Growth in business or service volume	Customer	4,54	3	3
Leadership skills (managers)	Human	4,41	5	4
Employees' information technology literacy	Human	4,38	8	5
Satisfaction of employees	Human	4,30	2	6
Number of customer complaints	Customer	4,25	9	7
Years of experience	Human	4,20	1	8

Based on the obtained qualitative results of assessing the effectiveness and importance of the factors that determine the IP of the IT-enterprise, we offer the IP management organization intending to reflect the IT business specifics, to follow consistency of goals and resources of IP, to enhance data collection timely, to centralize knowledge management, and to leverage intellectual resources. It is believed that parallel organisational structure aligned to the existing structure will contribute to a better understanding of IP and its optimal use. IP management should be dissolved among senior management positions and be one of the functions of the staff. In addition, building a line management (directorate or department) responsible for IP management will strengthen the processes of identifying, protecting, monitoring, evaluating and promoting IP in the knowledge-intensive and information-rich environment of the enterprise IT according to the structural parts of intellectual potential (Fig. 2).

Although the introduction of such an organisational change may increase the cost of human and organisational resources, such a focus will ensure the important development of significant intellectual

potential and future competitiveness and profitability. The implementation of such organisational change should be preceded by the active development of the IT enterprise, which should reach a new qualitative level of activity.

Some aspects of the chosen IP management structure such as double subordination of employees, the complexity of monitoring the implementation of tasks, low flexibility and risk of inconsistency of goals and resources for their implementation can become the main reasons of possible risks occurrence while using this structure.

The specific approach of the IT enterprise to creating better software products is a software process improvement on knowledge-, competencies-, and experience of working practitioners in the enterprise. In addition, the enterprise cannot ensure the transition to innovative production, as well as the implementation of some effective activities without the appropriate level of functional development of intellectual potential. Considering this fact and addressing the issues revealed in the abovementioned qualitative research, the prototypes of functional properties of the IP management platform for IT enterprises are offered (Fig. 3).

The functionality of the IP platform should be adjusted for remote work of the IT enterprise and deployed on Android and iOS operating app systems. Informational organization of the platform includes organization of IP-related indexing information, keeping accurate records of intellectual potential, maintenance and using of project artifacts, collection of various content (article, external links on useful material, videos, trainings, etc.), quality control, flexible educational content according to the learning needs, onboarding information, etc. The single center for the management of IP and establishing control over the platform will ensure its higher efficiency. The possibility of rapid data collection at the functional level and their analysis at the centralized level as one of the key advantages of the approach becomes possible due to the implementation of the platform. The offered functional composition of the platform provides comprehensive framework, which can be adjusted to the specifics of various IT companies and their organizational needs with refined changes during implementation. Future stages include meticulous testing of functions, iterative development, and consequent evaluation to adjust the platform with the business goals and expectations of users.

⁵ developed by authors

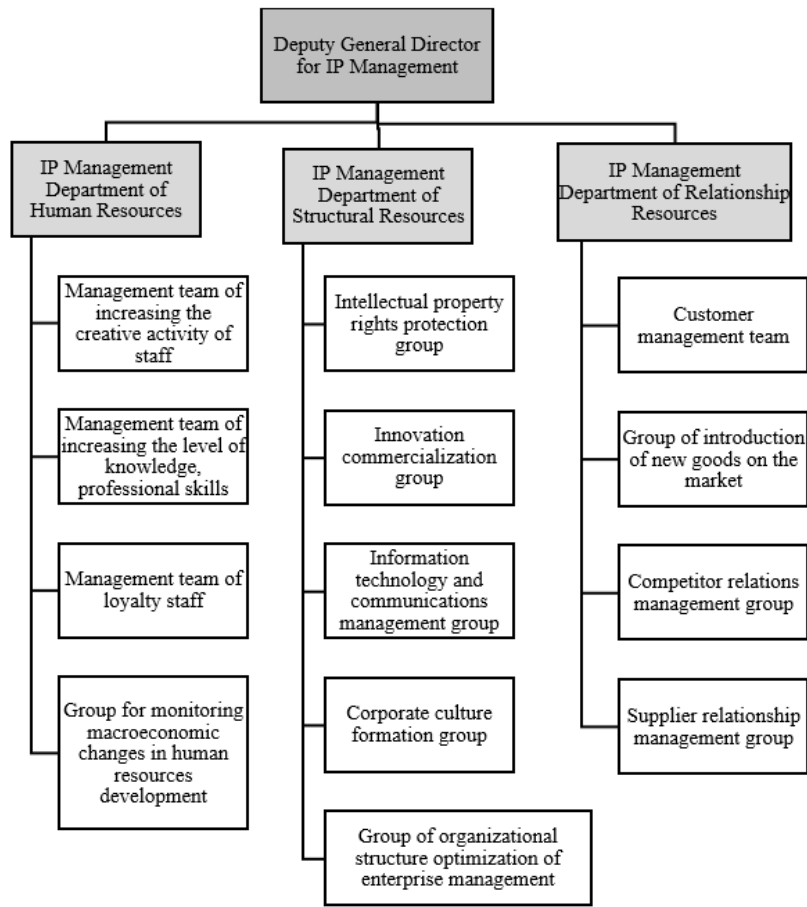


Figure 2: Organizational structure of IP management ⁶.

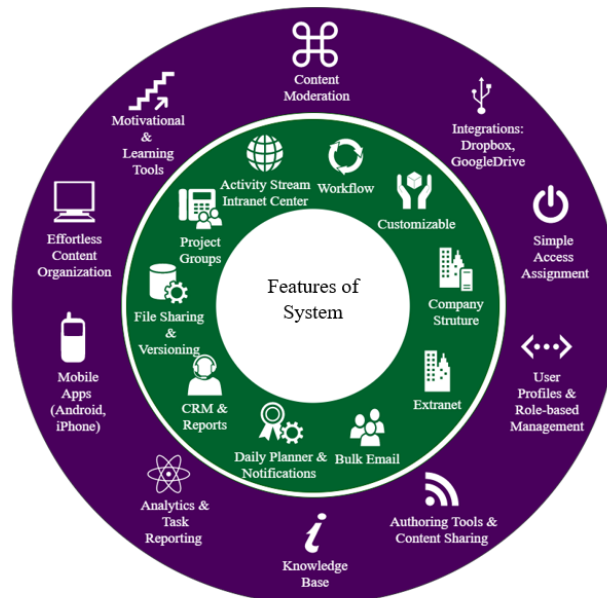


Figure 3: Functional properties of the IP management platform ⁷.

^{6, 7} developed by authors

5 CONCLUSIONS

Because of the theoretical foundations research of the enterprise's intellectual potential issue the general essence, main functions and constituent elements of IP were revealed. The vast majority of scientists define enterprise's intellectual potential as the ability to generate future economic profits from existing intangible resources. The most widespread general approach to defining intellectual potential is its division into human, structural, information and relationship potential. The factors of the enterprise's intellectual potential development were divided into the stimulating and restraining groups. Due to qualitative assessment of knowledge management system, knowledge quality and accuracy were determined as the most prominent indicators of its factual efficiency on the IT enterprise.

In addition, the range of intellectual potential indicators was used to identify increased levels of motivation and creative initiatives as promising drivers of IP improvement in the IT organization. Within the framework of the structural approach to IP, a number of indicators have been identified that will determine the status and efficiency of IP use at the enterprise IT. Taking into account the identified indicators and factors of influence, it was offered to introduce an additional organizational unit and IP management functions into the existing structure. At the same time, the functionality of the information platform is outlined, which serves as the basis for the development and centralized management of IP of an IT enterprise.

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