ABSTRACT
The existing intelligence models for managing innovative development projects and programs are fragmented and do not allow getting the maximum value from their application. The development of the architecture of an integrated intelligent control model will significantly increase the value of the products of projects and programs when using such models. To evaluate the effectiveness of the proposed architecture of an integrated intelligent system, competence-based models for managing innovative projects and programs are used. To evaluate the effectiveness of the implementation of the intelligence model, the competencies that make up the Pareto area are proposed for each domain of the integrated intelligence model. The integrated intelligence model within the proposed architecture has five groups of interrelated competencies: business, social, emotional, technical and cognitive. As a tool for assessing the organization’s competence in the field of innovative development projects, a model based on the mechanisms of the IPMA Delta system was used. The case study was carried out on the example of the application of an integrated intelligence model for the preparation of a master’s at the Project Management Department of the Kyiv National University of Construction and Architecture.

KEYWORDS
Business, Cognitive, Competencies, Emotional, Innovation project, Intelligence model, Managing projects, Social, Technical

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1. INTRODUCTION

Dr Howard Gardner introduced the theory of multiple intelligences systems in 1987 [9]. The initial hypothesis of this theory suggests that the traditional use of intelligence is significantly limited. Gardner proposed eight different areas of intelligence. These areas are: spatial, linguistic, musical, logical-mathematical, intrapersonal, bodily-kinesthetic and naturalistic.

The development of project management standards and methodologies is associated with the hybridization, convergence and integration of methodologies that are different [16, 17]. The dynamic development of the concepts and knowledge of project management confirms the significant practical interest in this field of activity [1, 3].

The sustainable dynamic development of several countries, driven by the digitalization of economies, is determined by the use of modern methodologies for managing innovative projects and programs [5, 18]. The synergy of project management systems and intellectual models of the digital economy based on open Internet technologies determines the need to create integrated intelligent systems based on information technology, and the use of such systems and tools for managing innovative projects [4].

Another intelligence tools we are understood: the concepts of information modelling, project implementation and business intelligence, with our methods, tools and technics [11]. The integrated use of intelligence tools allows one to obtain processes, use new knowledge and increase the effectiveness of project management to achieve goals [7].

The purpose of the research is to develop the architecture of the project management intelligence system.

2. ANALYSIS OF RECENT RESEARCH AND PUBLICATION

Business intelligence (BI) provides the ability to extract insights from unstructured data and transform them into actionable information to make informed strategic decisions [8, 10]. This improves operational efficiency and business productivity. The obtained data allows you to select important information that shows the main trends in the behaviour of the business environment for the preparation and adoption of key development decisions [6]. The resulting information is generally underused, except when it is used for quality assurance purposes.

Modern cognitive models are used to achieve the following two goals:
— when a cognitive model is used to formally describe cognitive processes to analyze the observed behaviour of stakeholders in a specific situation and explain the effects observed in solving a given problem;
— when the parameters of the cognitive model, estimated from the observed behaviour, are used as estimates of differences in people's behaviour when making decisions.

For business modelling, we use the well-known CANVAS model [23].

This model includes nine blocks:
1. Value proposition – what value do you offer to the market, what is your product or service?
2. Customer segments – who are the customers, identify the general groups of these target segments.
3. Relationships with customers – how will you attract and retain customers, and build their loyalty?
4. Channels – how will consumers find out about you (communication) and how will you deliver products (distribution)?
5. Key actions – how to find a way to consumers and make a profit? What actions are needed to implement the business model?

6. Key resources – what is needed for the successful functioning of the business model? It can be funds, personnel, equipment, raw materials and knowledge.

7. Key partners – potential and existing partners of a startup, which organizations, and individuals are ready to influence positively or are already involved in the work on the project?

8. The structure of expenses – funds will be spent on actions, activities, events, purchases, how much is needed for the project to work, launch a startup, and the like.

9. Streams of income, cash receipts – where are the funds expected or coming from that make this model a business model?

These blocks can be combined into certain groups, in particular:
- value proposition;
- infrastructure (resources, key actions, partners);
- customers (segments, communication channels, relationships with consumers)
- finance (expenditure structure and income streams).

Consider the architecture of an Integrated Intelligent System as an organization of a system consisting of its elements and their relationship with the internal and external environment [19, 20, 21].

Today there is no single definition of the most essential elements of the architecture of an intelligent system. It largely depends on:
- elements of the intellectual system;
- ordering and interrelations of elements;
- principles of system organization of the model;
- principles of managing the evolution of the system throughout the life cycle.

Architectural solutions are seen as more abstract, conceptual and global [2, 12]. The evaluation of the business model architecture of the organization [22, 24], based on which the review of the Integrated Intellectual Model was carried out, is as follows:

1. Are the values clearly articulated, or is the added value that is created for stakeholders?
2. Which market segment is the technology useful for?
3. What is the structure of the organization’s value chains?
4. What additional assets support the organization in these value chains?
5. What is the mechanism and structure of the cost of production, taking into account the created value and the chain of its creation?
6. What is the state of the organization concerning suppliers?
7. As a connected structural model of business processes, customers and competitors?
8. How is a competitive strategy formulated to gain an advantage over competitors?

The answers to these questions will allow us to move from a functional architecture model to a competency-based one [13, 14, 15]. Within the framework of the competency model, it is necessary to single out the Pareto area of competencies for each of the five areas of the proposed architecture of the Integrated Intelligent Model for Innovation Project Management. The Integrated Intelligence Model of Competencies Architecture for managing Innovation Projects and Programs is shown in Figure 1.

The architecture includes five dimensions (elements) of the model, which are combined into one toolbox. At the same time, all elements of the architecture model were taken into account, such as stakeholders, functions, values, competencies, and relations between elements.
Consider each component of the architecture model.

1. Intelligent project management. Within this dimension, tools for hybridization, adaptive management, application of knowledge bases and creative templates are intensively created. This saturates this dimension of the model with intelligent tools and mechanisms.

2. Business intelligence is in active development. New generations of knowledge bases and methodologies are being formed that use intelligent technologies for processing big data, visualizing business situations, forecasting and foresight.

3. Technical intelligence, including cognitive mechanisms, is associated with open innovations and breakthrough technologies, the acquisition and use of knowledge by working with artificial intelligence systems. Within the framework of this projection, architects consider the readiness to introduce innovations and the innovative potential of the organization.

4. Emotional intelligence is associated with the behavioural qualities of managers in an organization such as leadership, inspirational intuition, flexibility, self-management and flexibility in teamwork.

5. Social intelligence is defined by empathy, the ability to work in social networks to achieve goals, influence and respect in society.
3. COMPETENCIES INTELLIGENT MODEL OF MANAGING INNOVATION PROJECTS

Let’s consider the transformation of a functional architecture model into a competency-based model in five dimensions.

In the dimension of Project Management Intelligent, we single out the following competencies:
- application of hybrid management tools;
- using adaptive control mechanisms;
- application of knowledge bases and creative templates.

In the dimension of Business Intelligence, we will define the following key competencies:
- application of new business development methodologies;
- using business intelligence based on big data;
- visualization of situations in making business decisions;
- forecasting and foresight of business development.

Dimension Technical intelligence, we single out the following competencies;
- application of cognitive mechanisms for the implementation of innovations;
- using open innovations;
- creation of breakthrough technologies in innovative development;
- application of knowledge based on artificial intelligence methods;
- assessment of the readiness of innovative potential for development.

In the dimension of Emotional Intelligence, we define the following competencies:
- applying inspiring intuition;
- demonstrating leadership;
- implementing self-management;
- organizing flexibility of teamwork.

The social intelligence dimension is defined by the following competencies:
- demonstrating empathy;
- working in social networks to achieve the goal;
- implementing influence;
- supporting respect in society.

The proposed architecture of the Project management intelligence is based on the Intelligence toolbox which contains the templates of intelligence tools and techniques in the format of a

The assessment of competence is based on the proposed Key Intelligence Indicators model [14].

In the case of the proposed intelligence competence model study according to the application of the proposed conceptual model. An assessment model had been developed for the Double degree Master’s program. This program was implemented at Kyiv National University of Construction and Architecture for the preparation of Project managers.

As the results of this program have been selected by a group of 12 students. This group was assessed according to five domain-proposed models of selected sets of competencies based on IPMA OCB and IPMA ICB 4 standards [13, 14].

The assessment process used a checklist that contains more than 200 questions. Each student was asked 30 questions. Examples of these questions for different domains are given below:
Are the project, program and portfolio mission, vision and strategy aligned with the organization’s overall mission, vision and strategy?

Does the organization provide standards, regulations or guidelines for defining, planning and controlling the people’s competence and capacity requirements?

Does the organization promote openness, transparency and confidence as well as ethics?

As a result of processing the answers, the levels of assessments by areas of competence were obtained. The benchmark was determined by the teacher based on the required level of intelligence in solving the task.

Table 1. Initial assessment level competencies result according to the benchmark of project success by application of Integrated intelligence model

<table>
<thead>
<tr>
<th>Key competencies by dimension</th>
<th>Assessment</th>
<th>Benchmark</th>
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<tbody>
<tr>
<td>Application of hybrid management tools</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Using adaptive control mechanisms</td>
<td>9</td>
<td>7</td>
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<tr>
<td>Application of knowledge bases and creative templates</td>
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<td>7</td>
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<tr>
<td>Using business intelligence based on big data</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Visualization of situations in making business decisions</td>
<td>9</td>
<td>7</td>
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<tr>
<td>Forecasting and foresight of business development</td>
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<td>7</td>
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<tr>
<td>Application of cognitive mechanisms for the implementation of innovations</td>
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<td>Creation of breakthrough technologies in innovative development</td>
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<tr>
<td>Application of knowledge based on artificial intelligence methods</td>
<td>8</td>
<td>7</td>
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<tr>
<td>Assessment of readiness of innovative potential for development</td>
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<td>7</td>
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<tr>
<td>Applying inspiring intuition</td>
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<td>6</td>
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<tr>
<td>Demonstrating leadership</td>
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<td>6</td>
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<tr>
<td>Implementing self-management</td>
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<td>6</td>
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<tr>
<td>Organizing flexibility of teamwork.</td>
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<td>6</td>
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<tr>
<td>Demonstrating empathy</td>
<td>8</td>
<td>6</td>
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<td>Working in social networks to achieve the goal</td>
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<td>6</td>
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<td>Implementing influence</td>
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<tr>
<td>Supporting respect in society</td>
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</table>

PROJECT MANAGEMENT INTELLIGENCE ARCHITECTURE
As a result of the analysis of the level of competence in comparison with the benchmark, three areas were identified: "Application of knowledge bases and creative templates", "Assessment of readiness of innovative potential for development", "Supporting respect in society" where the level of competence was lower than the benchmark. According to these competencies, the necessary pieces of training were carried out, and additional regulations for the work of the team of managers were developed. The result of corrective actions is given in Table 2.
Table 2. Assessment level competencies result according to the benchmark of project success by application of Integrated intelligence model after corrective actions

<table>
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<td>Intelligent project management</td>
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<td>Application of knowledge based on artificial intelligence methods</td>
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<tr>
<td>Technical intelligence</td>
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<tr>
<td>Assessment of readiness of innovative potential for development.</td>
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</tbody>
</table>

Assessment level competencies result according to the benchmark of project success by application of the Integrated Intelligence Model after corrective actions are shown in Figure 3.
Assessment level competencies result according to the benchmark of project success by application of the Integrated Intelligence Model after corrective actions show a significant increase in the competence of the management team in three areas “Application of knowledge bases and creative templates”, “Assessment of readiness of innovative potential for development”, “Supporting respect in society”. This leads us to the conclusion about the readiness of the management team and the environment for the successful implementation of innovative projects and programs.

3. CONCLUSION

The proposed architecture of an intelligent project management system is based on a system of interconnected creative templates placed in the Intelligence toolbox. The Intelligence toolbox management system, under certain conditions and requests from project managers, prepares an integrated creative template within the competence of the project manager, which includes the necessary sections of the remaining areas of the model.

The considered case study allows for expressing confidence in the practical acceptability of the proposed model of intelligence architecture. At the same time, the use of the IPMA OCB organizational competence assessment system confirmed its efficiency and practical applicability in innovative development projects of organizations.
Directions for further research are related to:
- filling the Intelligence Toolbox with cases from different subject areas for the implementation of innovative projects and programs;
- considerable interest in further research is the extension of the model of assessment by the Competencies Intelligence Model for the success of Innovation Projects;
- the level of the benchmark for each competence of the Integrated Intelligence Model is subject to a more thorough study.

REFERENCES