

S. BUSHUYEV, D. BUSHUIEV, B. KOZYR

## DEVELOPMENT PROJECT MANAGEMENT CAPABILITY OF THE INFRASTRUCTURE PROGRAM. CHERNOBYL CASE

The Project Management methodology became one of the bases for the development of the ChNPP. The **subject** of research is the process of development the project management capability for infrastructure program based on the Chernobyl case. **Objective:** to develop and apply a tool for development key competence as the organization capability for managing infrastructure program using Chernobyl NPP experience. **Tasks:** to analyze the historical facts, factors influencing the organizational competence and the possibility of introducing key competence in the organization's activities, to obtain a general algorithm for the development project management capability. Research methods: historical analysis, logical generalization, analysis and synthesis, structural analysis. **Results:** The article considers the key competence of the organization as the main component of the management capability of the complex program the company implements. The facts given above say that the activity which is carried out on a platform of the Chernobyl NPP, in many aspects is innovative and at creation on the Chernobyl NPP of an effective Knowledge Management System of project implementation experience, this knowledge can be applied as the professional development of acting project managers of the ChNPP (for example, to development of target courses), and to transfer of the accumulated experience (through realization of the benchmarking mechanism) to external costumers. The weighed system approach to Knowledge management according to the Methodology of project management can not only render invaluable service to system of preparation of the personnel of the NPP, but also to promote definition of possible ways of collecting, storage and commercial realization of intangible assets of the **Conclusions:** The state-owned enterprise ChNPP stands at the border of a radical reorganization, when project-oriented business management is implemented alongside the existing standard organizational structure of business management. The activities at the Chernobyl NPP site are in many respects innovative and must be taken into account when organizing work. In order to create an effective project management system, the professional knowledge of the existing Chernobyl NPP project managers must be applied, and the accumulated experience (through the implementation of the benchmarking mechanism) to external customers must be transferred. A weighted systemic approach to knowledge management in accordance with the project management methodology can not only provide an invaluable service to the NPP personnel training system, but also help to identify possible ways of collecting, storing and selling intangible assets.

**Keywords:** diversification; unique experience; management of knowledge; innovations; project-oriented business management; project management methodology; benchmarking.

### Introduction

In a competitive world the organisation need to meet the high expectations of their stakeholders regarding the management of projects, programmes and project portfolios (PP&PM). Therefore, it is crucial for organisations to know their actual competence and capability status with the areas for improvement. Based on these findings an organisation can continuously improve and develop its competence for managing of projects, programmes and project portfolios.

The International Project Management Association (IPMA®), a leader in project management competence certification, offers a wide range of beneficial services for individuals, projects, and organisations. IPMA offers the Certification in the domains project, programme and portfolio management, as well as the IPMA Project Excellence Award® which annually honours project teams that achieve top performance worldwide [1].

On June 12–14, 2013 on construction site of object "Shelter" of the ChNPP the next (second) lifting of east section of the New Safe Confinement (further NSC), Arch is executed, then its general height reached 85 meters. It is one of six planned operations of lifting of large metalwork of NSC (3 lifting on each of Arch sections: east and western). On April, 26, 2012 building of a new shelter began above the 4<sup>th</sup> blasted power unit of the NPP. New protective building is the arched construction with a 257,4 meter

flight, 108,4 meter high and 150 meter long. An object is counted on 100 years of operation and will give the chance to carry out extraction of fuel-bearing materials and their conditioning for the subsequent safe storage. Conditioning – process at which the steady firm form of the waste suitable for temporary storage and burial is created. It was starting point of development project management capability and competence for this infrastructure program.

Less than 2 years ago on an assembly site of the Arch wasn't delivered any metal construction. For comparison, we will look at the photo of this site in November, 2011. Financing of works on the international project (the plan of implementation of measures on "Shelter" object) is carried out at the expense of the donor countries of the international Chernobyl fund "Shelter" (ChFS).

For ensuring the completion of works on NSC creation in April, 2011 the European bank of reconstruction and development (ERDB) provided the help to the government of Ukraine in the organization of the international conference on fund raising for a covering of missing financing of projects of Chernobyl fund "Shelter" and "Account of nuclear safety". As a whole, construction of an arch of a new sarcophagus on the ChNPP will cost about 1 billion euro. New Safe Confinement is shown on fig. 1.



Fig. 1. Final view of NSC

### A historical analysis of the program

In 80th years of the XX century – Chernobyl NPP is the most powerful nuclear power plant in the USSR [1]. According to the strategic development plans of power industry of the Soviet Union, the ChNPP had to become the largest nuclear power plant in the world and consist of six power units with an electric power of 1000 MWt everyone (on 3200 MWt of thermal power correspondingly). During accident of 1986, construction of 2 new power units was stopped.

Reactor explosion on the 4th power unit of the Chernobyl NPP on April 26, 1986 made the correction in strategic plans of the Soviet energetics. As a result of accident there was an emission of a huge amount of radioactive materials in environment. About 600 thousand people participated in elimination of consequences of the largest accident in the history of nuclear power, 200 thousand people were evacuated and moved, health of 1,7 million people is undermined. The quantity of the death connected with Chernobyl accident, including died from cancer years later, in official sources of information is estimated at 125 thousand people.

In 1986 in only six months, in difficult radiation conditions, scientists and experts of the former Soviet Union designed and constructed a protective cover for the breakdown reactor, called later officially "Shelter" object and received the historical name – "Sarcophagus".

Implementation of design decisions during construction of "Shelter" object in a difficult radiation situation demanded performance of a complex of organizational and technical actions for ensuring radiation protection of the personnel. Practical realization of the fundamental principles of radiation safety when carrying out dangerous works was reliably supported with the most strict discipline and quickly developed and put into operation instructions and regulations of performance of all radiation-hazardous works. In 1994 the world community in the person of leaders of "the big seven" and the European Union addressed to Ukraine with the offer to stop an operating Chernobyl NPP. In 1995 the Memorandum of understanding in which Ukraine undertook to stop power units of the Chernobyl NPP in 2000 was signed.

On December 15, 2000 Ukraine fulfilled the obligations for the termination of operation of "Chernobyl" power units and finally stopped the last working 3rd power unit of the ChNPP. For this moment were absent – the project of removal from operation of

ChNPP which according to norms had to be approved in 5 years before to station stop, and also Fund of removal from operation. The initial view of construction site is shown of the fig. 2.

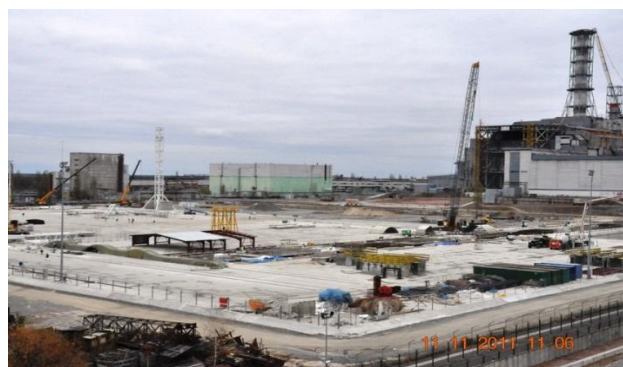


Fig. 2. Platform for Arch assembly, November 2011

On June 15, 2001 – the State specialized enterprise "Chernobyl NPP" (SSE ChNPP) - the enterprise for removal from operation of power units of nuclear stations and to transformation of "Shelter" object into ecologically safe system was registered [2].

Main tasks of SSE ChNPP were defined as:

- the safe operation of nuclear facilities, facilities for radioactive waste operation and other equipment of nuclear power plants;
- safe removal from operation of the first, second and third power units of the Chernobyl NPP and nuclear power plants of Ukraine;
- transformation of "Shelter" object to ecologically safe system;
- safety assurance due to the radioactive waste operation, which has been accumulated at an industrial site of this NPP and zone of alienation of the Chernobyl NPP, and also which are formed at removal from operation and during transformation of "Shelter" object to ecologically safe system;
- ensure the safe handling of spent nuclear fuel of the Chernobyl nuclear power plant;
- construction and operation of objects of the infrastructure necessary for removal of the Chernobyl NPP from operation and transformation of "Shelter" object into ecologically safe system;
- preparation and professional development of personnel;
- environmental monitoring of surrounding habitat in a zone of an arrangement of the Chernobyl NPP;
- development of technologies, accumulation and use of scientific and technical experience concerning removal of nuclear installations from operation, overcoming of consequences of beyond design basis accident, and also construction and use of storages for temporary and long-term storage of radioactive waste;
- organization, coordination and performance of scientific applied researches, introduction of scientific and technical and other development, establishment of communications with scientific institutions, including foreign;
- participation in coordinating of works and implementation of the international projects connected

with removal from operation of the Chernobyl NPP and transformation of "Shelter" object into ecologically safe system.

In 2001-2003 transition from functions and structure of the Chernobyl nuclear power plant to the specialized enterprise for removal of power units of nuclear stations from operation and to transformation of "Shelter" object into ecologically safe system was carried out. It allowed to solve problems of increase of safety of the Chernobyl NPP more effectively.

On March 22, 2002 the State committee of nuclear regulation of Ukraine gave to SSE ChNPP the license for removal from operation of the Chernobyl NPP. Earlier, the license for "Shelter" object operation and its transformation to ecologically safe system on December 30, 2001 was obtained.

In parallel with problems of removal from operation of power units of the ChNPP works on increase of safety of "Shelter" object were performed.

Within the TACIS project "Chernobyl power unit 4. Short-term and long-term actions – Actions 2 + 4" in 1996 was developed "The recommended course of actions" in which offered to develop potential short-term and long-term actions and a complex of prime measures for transformation of "Shelter" object into ecologically safe system. According to this document approved by the decision of the Interdepartmental commission on the complex solution of problems of the Chernobyl NPP from March 12, 2001, transformation of "Shelter" object into ecologically safe system is reached by realization of three main stages:

Stage 1: stabilization of a condition of existing object, increase of operational reliability and durability of structures and systems which provide stabilization and control of indicators of safety of "Shelter". The stage – is executed.

Stage 2: creation of the additional protective barriers, first of all a new safe confinement that will provide necessary conditions for technical activity at a stage 3 and safety of the personnel, the population and environment, the preparatory technical work directed on development of technologies of extraction from SO of fuel-bearing materials (FBM) at a stage 3, infrastructure creation for the operation with RAW "Shelter" object. It is planned to finish a stage in 2015 (except readiness of infrastructure of the address with RAW of "Shelter" object).

Stage 3: extraction from OU of fuel-bearing materials and long existing RAW, their conditioning with the subsequent storage and burial in RAW storages according to existing standards, removal from operation of "Shelter" object.

Dismantling of unstable structures of the "Shelter" (almost all the major steel structures, except in places where localized fuel containing material (FCM) is planned to carry out till 2023.

However, work activities for transformation of "Shelter" object don't come to the end with it, there is still a problem of extraction of FCM. It is a problem of higher level both of complexity, and of expenses as by estimates of experts in "Shelter" object is concentrated over 150 tons of fuel of the destroyed reactor, about 5,5 tons of

fresh and 15 tons of spent fuel. A significant amount yet not revealed fuel can be in blockages of the central hall of the destroyed power unit. All of this makes process of extraction of fuel-bearing masses by the most dose costly type of works and demands joint efforts of experts in the field of nuclear safety and radiation protection of all developed countries for the solution of this problem. In 1997, with the assistance of the European Commission, the United States, Ukraine, and a group of international experts at the meeting of the countries of the Big seven the Plan of implementation of actions for transformation of "Shelter" object into ecologically safe system (further SIP).

On September 17, 2007 the contract between SSE CHNPP and consortium NOVARKA formed by the leading French companies (VINCI Construction Grands Projets – 50% / Bouygues Travaux Publics – 50%) as "the turnkey project" which includes "Design, construction and NSC commissioning" is signed.

---

### Formulation of the problems

---

The purpose of this article is to develop and apply organization development tools and key competencies for managing an infrastructure program based on the experience of the Chernobyl NPP.

To achieve this goal, the article must solve the following tasks:

- analyze the historical facts of the Chernobyl NPP design solutions;
- to analyze the factors affecting organizational competence and the possibility of introducing key competences in the organization's activities;
- construction of a generalized algorithm for developing project management potential. Research methods: historical analysis, logical generalization, analysis and synthesis, structural analysis.

---

### Presentation of the main material

---

For development project management capability Ukrainian Project Management Association prepares and implemented training and coaching program for the ChNPP Project Management Unit. As the reference model in this case was proposed to apply IPMA Delta for assessment of organisational competence (capability) in Project Management [2, 3].

One of the important problem which the Chernobyl NPP management has faced, there was an absence of personnel experience of removal from operation including, design activity management which affected on success of projects implementation on the Chernobyl NPP platform. This argument sounded more than once in the analysis of temporary failures during construction of objects of infrastructure of removal from operation.

Results of implementation of projects on a platform of the Chernobyl NPP more and more define success of performance of a complex of works on removal of power units of the ChNPP from operation and to transformation of "Shelter" object into ecologically safe system.

---

Introduction and development according to the international standards of Project and Program Management Methodology on the Chernobyl NPP, and specifically in Project Management Unit (further SIP-PMU), allows to operate projects realized on a platform of the Chernobyl NPP more effectively, including the project on creation of the New safe confinement [4,5].

In recent years the management of the State specialized enterprise "Chernobyl NPP" with support of the Ukrainian association of management (further UPMA) made big efforts for the professional development of the personnel of the ChNPP which taking direct part in implementation of projects on a site.

Below is a far from complete list of training and master classes on which were trained, both the personnel of SIP-PMU, and the personnel of the Customer (SSE CHNPP) is provided [6,7]:

- Seminar on the organization of documentation management in the NSC project.
- Project management master class of the professor, Dr.Sc. Bushuyev S. D.
- Seminar on Construction project management.
- Certification passing on competence of area of management of projects according to the international requirements of IPMA.
- Development and implementation of process approach in project quality management.
- Master class: «Organizational development of Engineering and Innovation projects and Programs based on Japanese companies experience», by professors Bushuyev S. D. and H. Tanaka (Japan) and others.

Training of specialists of the ChNPP in a Master program in the Kiev National University of Construction and Architecture on Project Management chair is organized. Only since 2009 more than 100 specialists of the ChNPP received second higher education – the master in the field of project and program management [8, 9].

During this time more than 30 experts of the Chernobyl NPP were certified by system of the International Project Management Association IPMA, two experts are certified by Japanese Project Management Association PMAJ.

Now for the Chernobyl Nuclear Power Station works:

3 certified consultants in the field of project management (IPMA® PMC);

5 certified top project managers (IPMA® Level B).

A noticeable step forward in increase of level of professional project management on site of the Chernobyl NPP was carrying out of certification procedures by the UPMA, Kiev with delivery on December 16, 2008 to the Chernobyl NPP of the certificate No. K.01.0018.2008 about assignment to SSE CHNPP of 1 level of a technological maturity in the field of professional project management. It is necessary to specify also that the contract organizations participating in implementation of projects on "Shelter" object, also developing in areas of professional project management (so JSC Yuzhteploenergmontazh (YuTEM) in 2008 was certified on the 3rd level of a technological maturity in the field of project management).

As a result of further development of methodology and procedure of national approach to certification of the companies in the field of project management, in 2008-2009, this approach was adapted by UPMA (in close cooperation with IPMA) under the international requirements and now is realized as the IPMA 4 LC standard within International Project Management Association (IPMA) which, certainly, raised level and practical value of participation in this procedure of the enterprises and the organizations practicing application of project and program management methodology in the activity [10 – 12].

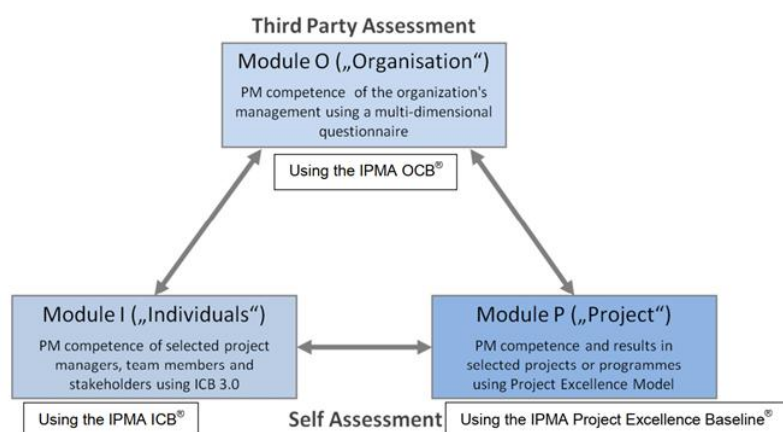
An organisation capability is assessed against the criteria for the five IPMA Delta® Competence Classes (Initial, Defined, Standardised, Managed and Optimising). The size and complexity of the certified organisation is identified. It is not intended that all organisations aim for IPMA Delta Competence Class 5. The management of the organisation decides which of the five IPMA Delta Competence Classes they want to achieve (table 1).

**Table 1.** Definition of Competence (capability) classes

IPMA Delta® Competence Classes				
Class 1: Initial	Class 2: Defined	Class 3: Standardised	Class 4: Managed	Class 5: Optimising
The achievements of Project Management are at a <b>personal level</b> . There are individuals who perform well, but performance is coincidental. The organisation has no formal PM standards, structures and processes in place.	There are partially defined PP&PM standards, structures and processes in place which are <b>partially applied</b> in the organisation.	There are fully defined PP&PM standards, structures and processes in place which are <b>mostly applied</b> throughout the organisation.	There are fully defined PP&PM standards, structures and processes in place which are <b>fully applied</b> throughout the organisation, which the Management actively controls.	There are fully defined PP&PM standards, structures and processes in place which are fully applied throughout the organisation, which the Management <b>actively controls and continuously develops</b> .

Certification of organisations competence (capability) in project management is one means of providing assurance that the certified organisation meets the requirements of the IPMA Delta Certification Scheme. Confidence in the respective certification scheme for the

project, programme and portfolio management competence of organisations is achieved by means of a globally accepted process of assessment and periodic reassessments of the competence of organisations that are certified [13, 16, 17].



**Fig. 3.** IPMA Delta® Modules I, P and O

Module I shall be used as self-assessment for selected project managers, team members and other stakeholders.

With Module P, selected projects and programmes shall be evaluated in a self-assessment with regard to the application of project management and project results – through the eyes of the project manager and individual project team members.

Module O shall be for third party assessment only and is comprehensive. It serves the assessors as check list and documentation baseline for the on-site visit.

During the on-site visit the results of the self-assessments of module I and P shall be double-checked.

In each module the links to the other modules shall be cross-checked through defined questions, for example, one question in Module I shall be whether the organisation informs the individuals about its mission, vision and goals regarding PM [18].

Example of self-assessment according module Individual is presented on the table 2.

Example of self-assessment according module Projects is presented on the table 3.

**Table 2.** Fragment of self-assessment module Individual according competence classes

<b>3</b>	<b>Perspective</b>				
3.1	Strategy				
Purpose	To understand the strategy and strategic processes, thus enabling a certain management domain (project, programme or portfolio) to manage their project, program or portfolio within the contextual aspects.				
Score	1	2	3	4	5
3.2	Governance, structures and processes				
Purpose	To enable the individual to effectively participate in and manage the impact of governance, structures and processes on projects, programmes or portfolios.				
Score	1	2	3	4	5
3.3	Compliance, standards and regulations				
Purpose	To enable the individual to influence and manage the alignment of the relevant standards and regulations within the permanent organisation; the relevant sources of legislation and the standards and norms of both the organisation and the wider society and to improve the organisation's approach to these areas.				
Score	1	2	3	4	5

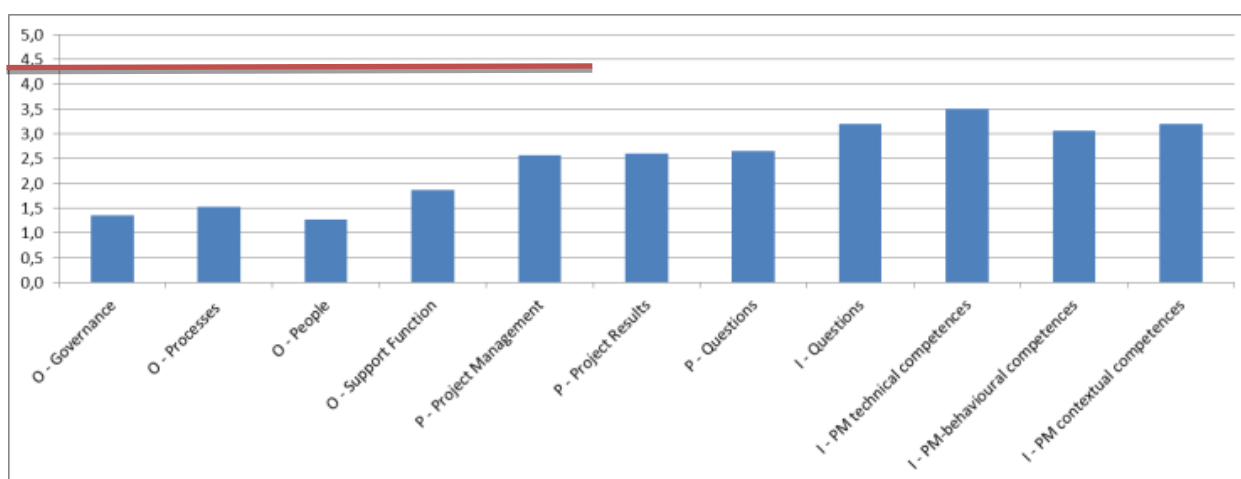
**Table 3.** Fragment of self-assessment module Projects according competence classes

<b>A</b>	<b>People &amp; Purpose</b>
<b>AI</b>	<b>Leadership &amp; Values</b>
A1a	Role model for excellence
Question	Do the Leaders communicate and live up to their values, follow ethical standards and act as role models?
<i>In practice, leaders of excellent projects:</i> <ul style="list-style-type: none"> <li>• Are role models for integrity, social responsibility, ethical behaviour and the project excellence philosophy, both within the project and its environment and ensure the project team members adopt and live up to these values;</li> <li>• Promote the organisation's values in the project;</li> <li>• Understand the concept of continuous improvement and champion its application in the project and beyond;</li> <li>• Actively seek feedback from different stakeholders to improve their leadership approach;</li> <li>• Regularly take time to reflect on their own role, behaviour and impact;</li> <li>• Review and improve the effectiveness of leadership behaviour including their own;</li> <li>• Strive for personal excellence by reviewing and improving their own competences;</li> <li>• Inspire project team members to strive for excellence in their behaviour and working methods, keeping in mind the objectives of the project;</li> <li>• Systematically integrate project team members into the continuous improvement process;</li> <li>• Foster innovation in the project and encourage project team members to do the same.</li> </ul>	

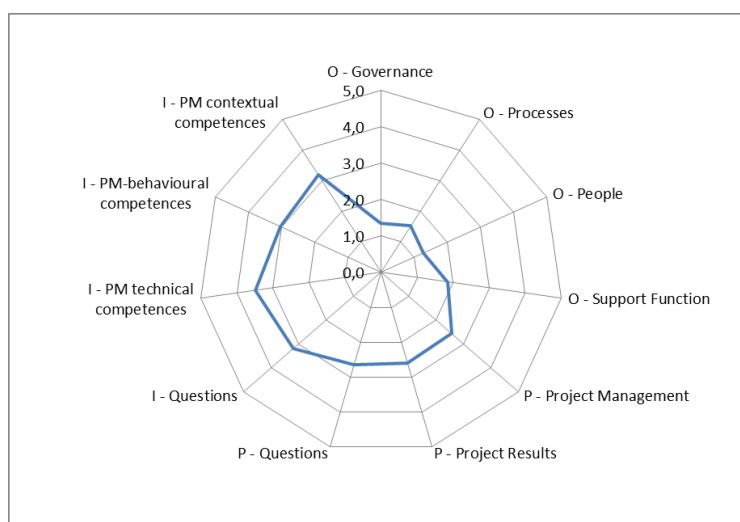
Example of assessment Checklist according module Organisation is presented on the table 4.

**Table 4.** Fragment of assessment according module Projects according competence classes

Competence element	ID etc.	Question	Area to check
PP&P Mission, vision & strategy			
PP&P Mission, vision & strategy	S	Does the organisation have a PP&P mission, vision and strategy?	Check website, brochures, mission statements, PM Regulations and Guidelines, Handbook, long-term and medium-term development of the organization and its PP&Ps
PP&P Mission, vision & strategy	S	Are the PP&P mission, vision and strategy aligned with the organisation's overall mission, vision and strategy?	Check relevance of PP&Ps for the organisation, kind and number of projects, directions of the top management. Compare PP&P mission, vision and strategy with overall mission, vision and strategy
PP&P Mission, vision & strategy	T	Does top management effectively communicate the PP&P mission, vision and strategy to all stakeholders and provide the necessary resources?	Check website, brochures, mission statements concerning products and services of the organisation and the corresponding PP&Ps



**Fig. 4.** Scoring of Competence (capability) assessment



**Fig. 5.** Visualisation of Competence (capability) assessment

Basis of certified processes according to the IPMA Delta standard is "benchmarking" procedure (transfer of the best experience). In separate coordination with IPMA in December, 2009 on the Chernobyl NPP the Europe's first pilot certification of the enterprise according to IPMA requirements is carried out. At declared by SSE CHNPP

2nd class, by results of the carried-out certification the decision by assessors on delivery to SIP-PMU, of SSE CHNPP of the certificate of 3 class of a technological maturity in the field of professional project management in accordance to criteria of IPMA was made [15, 16].



**Fig.6.** IPMA certificate of organization competence

Results of this certification will be considered as "standard" for carrying out procedures of similar certifications at other enterprises of Ukraine and Europe.

### Modern reality

Now at an industrial site of the Chernobyl NPP active work of creation of infrastructure of removal from operation and transformation of "Shelter" object is carried out, which in many aspects has innovative character.

For a past after final stops of power units of the ChNPP time are carried out basic changes of functions and personnel structure, a financial and economic and production activity, fixed assets of the enterprise.

It is necessary to consider also that after accident of 1986 the collective of the Chernobyl NPP was considerably updated. More and more skilled experts leave from the Chernobyl NPP on age or on a state of health. Less workers, direct participants of creation of the Sarcophagus ("Shelter" object) work at the Chernobyl NPP. The extensive experience for which it is paid by health and lives of liquidators of accident is lost.

At the time of a final stop of power units at the Chernobyl NPP worked 9051 persons (in 1996 – 1997 number was about 12000 people). In April, 2013 the number of employees of the ChNPP is 2764 persons.

Typical for the majority of construction projects the tendency on "extension" of the schedule of the project, wasn't an exception and for the objects erected on a platform of the Chernobyl NPP. So, at construction of "dry" Storage of the Fulfilled Nuclear Fuel (HOYaT-2) which is one of important objects of infrastructure of removal from operation of ChNPP, postponement is:

- 2003 – 2005 – 2013 – 2016.

Similar picture and with New Safe Confinement (NSC) commissioning:

- 1998 – 2005 – 2010 – 2012 – 2015.

However now there is a confidence that the situation with the NSC project is absolutely changed, the project passed to a "visible" final stage [11, 14].

This also was noted during visit of the Chernobyl NPP on June 4, 2013 by representatives of the investor countries of the Account of nuclear safety and Chernobyl fund "Shelter", and also technical advisers of Board of directors and representatives of Department of nuclear safety of the European bank of reconstruction and development. Guests visited directly a site of assembly of the Arch.

### Uniqueness of work performance

Let's consider the main problems which are solved now by the personnel of the Chernobyl NPP.

In the Statute of the Chernobyl NPP one of the purposes of creation of the State specialized enterprise is defined as task realization of a problem of removal from operation of the Chernobyl NPP and other nuclear stations of Ukraine. The ChNPP – the first nuclear station which is laid off in Ukraine, and considering the volume (at the same time removal from operation is carried out on three RBMK-1000 power units) and work conditions (existence on a platform of 1986 of the fourth power unit destroyed by beyond design basis failure), experiment on the organization of carrying out these works is demanded for power industry of Ukraine and other countries where RBMK reactors (Russia, Lithuania) are operated or laid off.

Since 1986, activity on a site of the Chernobyl NPP is under close attention of world science and the public. Numerous international scientific and public forums and conferences are held. On "Chernobyl subjects" a large number of theses is protected and many scientific works are written. It is removed a lot of art, documentary and educational films. Numerous excursions in the Chernobyl

zone of alienation and on the Chernobyl NPP are annually organized.

In 2000 Ukraine declared an innovative way of development. There were developed national programs and infrastructure which had to support innovations. It is obvious that realization of strategy of innovative development demands transfer of the best experience of the leading countries in this field. Regarding to this experience of Japanese companies it seems to be interesting. So, in accordance to developed by Japanese project management association (PMAJ) system of knowledge of P2M for management of innovative projects and programs, two of five components of strategy of new economic recovery of the organizations, enterprises and the country as a whole are defined as "intellectual potential (technologies and intellectual property)" and "knowledge (ability of management creatively to use various resources)".

Let's define assets which the personnel of the Chernobyl NPP, the people of Ukraine, the world community by results of activity on a platform of the Chernobyl NPP have:

1. Brand known for the whole world – "Chernobyl NPP". It isn't required to spend considerable money for its advertising. It is necessary to give to it new sounding, not "a source of the largest in the world of a technogenic catastrophe", but "a source of advanced technologies, the rich saved up experience and skilled competent staff".

2. On a site of the ChNPP unique for the whole world works on implementation of the Plan of implementation of actions on "Shelter" object are performed.

3. On a site of the Chernobyl Nuclear Power Station are carried out unique for power industry of Ukraine (Russia, Lithuania) works on simultaneous removal from operation of three channel reactors of big power.

## Conclusion

The historical facts and factors affecting organizational competence and the possibility of key competence in the organization were analyzed. P key competence of the organization is considered as the main component of the management ability of the integrated program that the company implements.

These facts indicate that the activities carried out at the site of the Chernobyl nuclear power plant are innovative. In order to create an effective project management system, the professional knowledge of the existing Chernobyl NPP project managers must be applied, and the accumulated experience (through the implementation of the benchmarking mechanism) to external customers must be transferred. A weighted systemic approach to knowledge management in accordance with the project management methodology can not only provide an invaluable service to the NPP personnel training system but also help identify possible ways of collecting, storing and selling intangible assets.

The introduction and development of international standards and methodologies for managing projects and programs make it possible to make a more effectively manage projects implemented on the platform of the Chernobyl NPP, including the project to create new safe confinement.

To increase the level of professional project management at the Chernobyl accident site, UPMA certification procedures have been developed. An example of an organization's self-assessment by competency levels is given. Certification of an organization's competence in project management has been one way to ensure that a certified organization meets the requirements of the IPMA Delta certification scheme.

## References

1. Bushuyev, S. D., Molokanova, V. M. (2017), "Formalization of the method of taking into account value memes in the development portfolios of organizations and ICTs - tools for its implementation" ["Formalizatsiya metodu vrakhuvannya tsinnisnykh memiv u portfelyakh rozvytku orhanizatsiy ta YKT – instrumentiv yoho realizatsiy!"], *Information Technologies and Learning Tools*, Vol. 62, No. 6. P. 1–15.
2. *Individual competence baseline for Project, Programme and Portfolio management (IPMA ICB)* (2017), IPMA. Version 4.0, 431 p.
3. *IPMA Organisational Competence Baseline (IPMA OCB)* (2013), IPMA, 67 p.
4. Bushuyev, S., Bushuyeva, N., Babaev, I. and etc. (2010), *Creative technologies of project and program management: "Summit-Book"*, 768 p.
5. Bushuyev, S., Wagner, R. (2014), "IPMA Delta and IPMA Organisational Competence Baseline (OCB): New approaches in the field of project management maturity", *International Journal of Managing Projects in Business*, Vol. 7, Issue 2, P. 302–310.
6. Bushuyev, S. (2015), "Development of innovation methods and models of project management on the basis of convergence", *Managing the development of complex systems*, No. 23, P. 30–37.
7. Kovi, S. (2007), *7 skills of highly effective people: Powerful personal development tools for Alpina Business Books*, 375 p.
8. Bushuyev, S., Bushuyev, D., Yaroshenko, R., (2017), "Deformation field of competence in innovative projects", *Bulletin of NTU "KhPI". Series: Strategic Management, Portfolio, Program and Project Management*, No. 2 (1224), P. 3–7. DOI: <https://doi.org/10.20998/2413-3000.2017.1224.1>
9. Bushuyev, S., Kharitonov, D., Rogozina, V., (2012), "Organizational Pathologies of Project Management" ["Organizatsionnyye patologii upravleniya proyektami"], *Management rozvitkom folding systems number*, No. 10, P. 5–8.
10. Kerzner, H. (1998), *In search of excellence in Project Management*, VNB, 274 p.
11. Guariano, N., Giaretta, P. (1995), "Ontologies and Knowledge Bases. Towards a Terminological Clarification", *Towards Very Large Knowledge Bases : Knowledge Building and Knowledge Sharing*, Amsterdam : IOS Press, P. 25–32.
12. Lytvynenko, D., Dorokhina, A., Artiukh, R. (2019), "Analyzing the interests and interaction of the participants of a transport system development project", *Innovative Technologies and Scientific Solutions for Industries*, No. 1 (7), P. 69–74. DOI: <https://doi.org/10.30837/2522-9818.2019.7.069>



13. Chernova, L., Mazurkevych, O., Chernova, L. (2018), "The model of assessing the general intensity of resistance to changes in an organization", *Innovative Technologies and Scientific Solutions for Industries*, No. 4 (6), P. 77–83. DOI: <https://doi.org/10.30837/2522-9818.2018.6.077>
14. Gruber, T. (1995), "Towards principles for the design of Ontologies used for knowledge sharing", *International Journal of Human-Computer Studies*, No. 43 (5/6), P. 907–928.
15. Kerzner, H. (2001), *Strategic Planning for Project Management Using a Project Management Maturity Model*, John Wiley & Sons Inc, 256 p.
16. Forsberg, K., Mooz, H., Cotterman, H. (2005), *Visualizing Project Management, 3rd edition*, John Wiley and Sons, New York, NY, P. 108–116, 242–248, 341–360.
17. Slivotsky, A. (2006), *Migration of Value [Migratsiya tsennosti]*, Mann, Ivanov and Ferber, 432 p.

Received 24.05.2019

#### Відомості про авторів / Сведения об авторах / About the Authors

**Бушуєв Сергій Дмитрович** – доктор технічних наук, професор, Київський національний університет будівництва та архітектури, завідувач кафедри управління проектами, Київ, Україна; e-mail: SBushuyev@ukr.net; ORCID: <https://orcid.org/0000-0002-7815-8129>.

**Бушуєв Сергей Дмитриевич** – доктор технических наук, профессор, Киевский национальный университет строительства и архитектуры, заведующий кафедрой управления проектами, Киев, Украина

**Bushuyev Sergey** – Doctor of Sciences (Engineering), Professor, Kiev National University of Construction and Architecture, Head of the Department of Project Management, Kyiv, Ukraine.

**Бушуєв Денис Антонович** – кандидат технічних наук, Київський національний університет будівництва та архітектури, доцент кафедри інформаційних технологій, Київ, Україна; e-mail: BushuyevD@gmail.com; ORCID: <https://orcid.org/0000-0001-5340-5165>.

**Бушуєв Денис Антонович** – кандидат технических наук, Киевский национальный университет строительства и архитектуры, доцент кафедры информационных технологий, Киев, Украина.

**Bushuiev Denis** – PhD (Engineering Sciences), Kiev National University of Construction and Architecture, Associate Professor of the Department of Information Technology, Kyiv, Ukraine.

**Козыр Борис Юрійович** – кандидат технічних наук, Київський національний університет будівництва та архітектури, доцент кафедри управління проектами, Київ, Україна; e-mail: KozyrB@ukr.net; ORCID: <https://orcid.org/0000-0003-3400-4571>.

**Козырь Борис Юрьевич** – кандидат технических наук, Киевский национальный университет строительства и архитектуры, доцент кафедры управления проектами, Киев, Украина.

**Kozyr Boris** – PhD (Engineering Sciences), Kiev National University of Construction and Architecture, Associate Professor of the Department of Information Technology, Kyiv, Ukraine.

## РОЗВИТОК ПОТЕНЦІАЛУ УПРАВЛІННЯ ПРОЕКТАМИ ІНФРАСТРУКТУРНИХ ПРОГРАМ. ЧОРНОБИЛЬСЬКИЙ КЕЙС

Методологія управління проектами стала однією з основ потенціалу розвитку ЧАЕС. **Предметом** дослідження є процес розробки потенціалу управління проектами інфраструктурної програми на основі Чорнобильського кейсу. **Мета:** розробити та застосувати інструмент розвитку потенціалу на основі ключових компетенцій організації для управління інфраструктурною програмою з використанням світового досвіду та досвіду Чорнобильської АЕС. **Завдання:** проаналізувати історичні факти, фактори, що впливають на організаційну компетентність і можливість ввести ключову компетенцію в діяльності організації, отримати загальний алгоритм розвитку потенціалу управління проектами. **Методи** дослідження: історичний аналіз, логічне узагальнення, аналіз і синтез, структурний аналіз. **Результати:** розглядається ключова компетенція організації як основний компонент управлінської спроможності комплексної програми, яку реалізує компанія. Наведені факти говорять про те, що діяльність, що здійснюється на майданчику Чорнобильської АЕС, багато в чому є інноваційною і при створенні на Чорнобильській АЕС ефективної системи управління знаннями досвіду реалізації проекту, ці знання можуть бути застосовані як до професійний розвиток діючих керівників проектів ЧАЕС (наприклад, розробка цільових курсів), а також передача накопиченого досвіду (через реалізацію механізму бенчмаркінгу) зовнішнім клієнтам. Зважений системний підхід до управління знаннями відповідно до Методології управління проектами може не тільки надати неоціненну послугу системі підготовки персоналу АЕС, але й сприяти визначенню можливих шляхів збору, зберігання та комерційної реалізації нематеріальних активів. **Висновки:** Державне підприємство ЧАЕС стоїть на кордоні радикальної реорганізації, коли поруч із існуючою стандартною організаційною структурою управління бізнесом реалізується проектно-орієнтоване управління бізнесом. Діяльність на майданчику Чорнобильської АЕС у багатьох відношеннях є інноваційною і її необхідно враховувати при організації робіт. Для створення ефективної системи управління реалізацією проекту повинні бути застосовані професійні знання діючих керівників проектів ЧАЕС, а також здійснена передача накопиченого досвіду (через реалізацію механізму бенчмаркінгу) зовнішнім клієнтам. Зважений системний підхід до управління знаннями відповідно до методології управління проектами може не тільки надати неоціненну послугу системі підготовки персоналу АЕС, але й сприятиме визначенню можливих шляхів збору, зберігання та комерційної реалізації нематеріальних активів.

**Ключові слова:** диверсифікація; унікальний досвід; управління знаннями; нововведеннями; проектно-орієнтованого управління бізнесом; методологія управління проектами; бенчмаркінг.

## РАЗВИТИЕ ПОТЕНЦИАЛА УПРАВЛЕНИЯ ПРОЕКТАМИ ИНФРАСТРУКТУРНЫХ ПРОГРАММ. ЧЕРНОБЫЛЬСКИЙ КЕЙС

Методология управления проектами стала одной из основ потенциала развития ЧАЭС. **Предметом** исследования является процесс разработки потенциала управления проектами инфраструктурной программы на основе Чернобыльского кейса. **Цель:** разработать и применить инструмент развития потенциала на основе ключевых компетенций организации для управления инфраструктурной программой с использованием мирового опыта и опыта Чернобыльской АЭС. **Задача:** проанализировать исторические факты, факторы, влияющие на организационную компетентность и возможность ввести ключевую компетенцию в деятельности организации, получить общий алгоритм развития потенциала управления проектами. **Методы** исследования: исторический анализ, логическое обобщение, анализ и синтез, структурный анализ. **Результаты:** рассматривается ключевая компетенция организации как основной компонент управленческой способности комплексной программы, которую реализует компания. Приведенные факты говорят о том, что деятельность, осуществляемая на площадке Чернобыльской АЭС, во многом инновационной и при создании на Чернобыльской АЭС эффективной системы управления знаниями опыта реализации проекта, эти знания могут быть применены как к профессиональному развитию действующих руководителей проектов ЧАЭС (например, разработка целевых курсов), а также передача накопленного опыта (через реализацию механизма бенчмаркинга) внешним клиентам. Взвешенный системный подход к управлению знаниями в соответствии с Методологии управления проектами может не только оказать неоценимую услугу системе подготовки персонала АЭС, но и способствовать определению возможных путей сбора, хранения и коммерческой реализации нематериальных активов. **Выводы:** Государственное предприятие ЧАЭС стоит на границе радикальной реорганизации, когда рядом с существующей стандартной организационной структурой управления бизнесом реализуется проектно-ориентированное управление бизнесом. Деятельность на площадке Чернобыльской АЭС во многих отношениях является инновационной и ее необходимо учитывать при организации работ. Для создания эффективной системы управления реализацией проекта должны быть применены профессиональные знания действующих руководителей проектов ЧАЭС, а также осуществлена передача накопленного опыта (через реализацию механизма бенчмаркинга) внешним клиентам. Взвешенный системный подход к управлению знаниями в соответствии с методологией управления проектами может не только оказать неоценимую услугу системе подготовки персонала АЭС, но и способствовать определению возможных путей сбора, хранения и коммерческой реализации нематериальных активов.

**Ключевые слова:** диверсификация; уникальный опыт; управление знаниями; нововведениями; проектно-ориентированного управления бизнесом; методология управления проектами; бенчмаркинг.

### *Бібліографічні описи / Bibliographic descriptions*

Бушуев С. Д., Бушуев Д. А., Козир Б. Ю. Розвиток потенціалу управління проектами інфраструктурних програм. Чернобыльский кейс. *Сучасний стан наукових досліджень та технологій в промисловості*. 2019. № 2 (8). С. 15–24. DOI: <https://doi.org/10.30837/2522-9818.2019.8.015>.

Bushuyev, S., Bushuiev, D., Kozyr, B. (2019), "Development project management capability of the infrastructure program. Chernobyl case", *Innovative Technologies and Scientific Solutions for Industries*, No. 2 (8), P. 15–24. DOI: <https://doi.org/10.30837/2522-9818.2019.8.015>.