

Проаналізовані концептуальні підходи до формування гендерної чутливості системи управління проектами та програмами відповідно до глобальних принципів гендерної рівності у бізнесі (Gender Equality Principles, GEP). Визначено організаційно-структурну специфіку інтеграції гендерних компонентів та висвітлено їх реляційний вплив на рівень організаційної зрілості проектного менеджменту компаній. Запропоновано модель оцінки гендерної зрілості організації на платформі моделі зрілості проектного менеджменту (Project Management Maturity Model, PMMM)

Ключові слова: гендермейнстрімінг, зрілість управління, гендерна зрілість організації, організаційний потенціал, гендерна відповідальність

Проанализированы концептуальные подходы к формированию гендерной чувствительности системы управления проектами и программами в соответствии с глобальными принципами гендерного равенства в бизнесе (Gender Equality Principles, GEP). Определена организационно-структурная специфика интеграции гендерных компонентов и описано их реляционное влияние на уровень организационной зрелости проектного менеджмента компании. Предложена модель оценки гендерной зрелости организации на платформе модели зрелости проектного менеджмента (Project Management Maturity Model, PMMM)

Ключевые слова: гендермейнстриминг, зрілість управління, гендерна зрілість організації, організаційний потенціал, гендерна відповідальність

UDC 005.8:004.424.2:316.346.2

DOI: 10.15587/1729-4061.2017.28031

DEVELOPING GENDER MATURITY MODELS OF PROJECT AND PROGRAM MANAGEMENT SYSTEM

T. Fesenko

PhD, Associate Professor
Department of Engineering and Architecture
Luhansk National Agrarian University
Alchevskykh str., 44, Kharkiv, Ukraine, 61002
E-mail: fesenkotatyana@gmail.com

G. Fesenko

PhD, Associate Professor
Department of History and Cultural Studies
O. M. Beketov National University of Urban
Economy in Kharkiv
Marshala Bazhanova str., 17,
Kharkiv, Ukraine, 61002
E-mail: Galyna.Fesenko@kname.edu.ua

1. Introduction

It is known that in the current dynamic environment, the organizational project and program system must be able to adapt quickly in order to ensure control of key management parameters. A special place among the new approaches to the assessment of the maturity of project management is occupied by gender. According to the strategies of the UN, the European Union, the gender perspective should be integrated into the evaluation processes of any planned activities (within the policy, programs, etc.) as they affect women and men in all fields and at all levels [1]. According to international experts, the gender approach has the considerable heuristic potential for project and development programs management. In this regard, the issues of forming gender-balanced management system are updated, in particular by improving the existing management maturity models.

There exist unresolved questions about their implementation at national and local levels, in spite of the recognition of the value of gender principles for business on a global level. In Ukraine, there is the tendency of rather slow dissemination of gender mainstreaming (GM) approach, about what, in particular, an increase in the "gap" in the global index of development with leading countries suggests. There is currently some uncertainty, both in theory and practice, as to assessing the companies' maturity in correlation with the gender principles.

The theoretical and methodological situation is complicated due to the fact that gender-sensitive approaches are at the insufficient level of presence in the scientific discourse, as well as relevant methodological studies of organizational project management maturity. The existence of significant implementation problems of GM management encourages the development of new and improvement of existing models and methods and management tools. The use of GM approach in project management should be a mandatory component of the architecture of projects and programs, both at the level of internal organizational processes and external organizational communication. It is possible to improve the level of process (planning, monitoring, execution) control in the project activities by using GM, as well as to increase the institutional capacity of the company as a whole. It is essential that appropriate gender-sensitive indicators were "embedded"/integrated into the structure of the organization/project, and that they, in turn, were included in the guidelines for monitoring and evaluation, as well as the requirements for their implementation.

2. Literature review and problem statement

The general theoretical basis for project and program management maturity research is seen in the concepts of Capability Maturity Model Integration (CMMI) [2], Orga-

nizational Project Management Maturity Model (OPM3) [3], Portfolio, Programme, and Project Management Maturity Model (P3M3) [4], Project Management Maturity Model (PMMM) [5]. Also, the maturity model, in which attention is focused on the need to maintain a continuous relationship with stakeholders' and manage their expectations (Stakeholder Relationship Management Maturity, SRMM) was developed [6]. It is stressed that organizational growth occurs through the integration of the methodology to all projects and programs.

However, the vast majority of researchers use the PMMM as a conceptual platform for modeling organizational maturity. Most of the organizations that have chosen a project management as a key strategy use PMMM self-assessment tools. In particular, PMMM implementation in the maturity model of educational organizations is proposed in the research paper [7], "structure maturity model aimed at supporting eco-design processes" is presented in [8], and the authors of [9] developed [9] program management organization maturity integrated model for mega construction programs.

The researchers [10] also combine two methodologies (PRINCE2 and RMMM) to create a new model of maturity (R2SMM). This model is based on the levels of organizational development, such as "knowledge", "recurrence", "management", "integration", "continuity". The authors of [11] developed an "integrated management systems maturity model" that combines three ratings "key technological agents", "external factors" and "effective management system".

Nowadays there is increasing interest in the inclusion of gender components in the process of organizational development. Thus, the relevant gender indices are offered globally. This is reflected in the guidance document of the United Nations (UN), adopted in 2010, in which the basic principles of empowering women in business are declared [12].

However, the researchers point out the importance of gender components for organizational development of companies. Feminist theories to analyze the gender context of organizational communication are used [13]. The attempt of synthesis of feminist and organization theories was carried out in [14] to highlight the issue of "gender barriers" in organizational systems. The author also stresses the need for the gender-based approach to solutions development and decision-making processes. And she notes that the inclusion of alternative practices, based on the perception of the problem by women, in this process also leads to a change in the quality and content of the management model [15].

3. The purpose and objectives

The aim of the research is the development of theoretical and methodological solutions for the integration of a gender perspective in the project and program management systems at the level of organizational maturity.

To achieve this goal, it is proposed to solve the following tasks:

- to determine the conceptual approaches to the development of gender maturity of project-oriented management;
- to analyze the role of the gender factor in the company sustainable development and to determine the principles of the "company gender maturity";
- to develop an evaluation tool to measure the level of organizational and technological maturity, taking into account gender-sensitive indicators.

4. The concept of gender organizational maturity in project management

The problem of improvement and development of existing models of organizational and technological maturity is stated guided by a modern understanding of the dependence of the level of technological maturity of project management on gender components. Thus, the following gender correlation of maturity of project management systems [1], employing a total logic of organizational and technical maturity of project management by PMMM is proposed [5]. It should be noted that gender progress in acquiring management maturity is associated with all levels (common terminology, common processes, a single methodology, benchmarking, continuous improvement). For the first level, it is proposed to assess knowledge of gender terminology, including Gender Equality Principles (GEP). These principles are developed in the form of practical standards for companies and structured in seven blocks, including "work-life balance and career development"; "management and leadership"; "business, supply chains and marketing practices"; "leadership, transparency and accountability" and others [16].

Compliance of companies with the gender equality principles leads to improvement of organizational processes, both at the individual project level and the organizational system in general (Fig. 1).



Fig. 1. Conceptual model for integrating gender components into the organization architecture

The proposed conceptual model for integrating gender components into the organization architecture determines the significance of gender-sensitive context for the various administrative processes. The model includes the epistemic potential for the development of tools for gender assessment of organizational capacity of companies in such system blocks:

- mission, strategic planning;
- management structure and management style;
- adaptability;
- partnership and cooperation;
- role in the field;
- provision of services;
- financial viability and resource mobilization.

5. The results of gender maturity modeling

The author’s approach is based on an attempt to evaluate the level of integration of gender contexts in the architecture of an organizational system. For this purpose, five gender principles are singled out: gender equality in the workplace; gender-balanced management and leadership; gender-just organizational processes; promoting equal participation of

women and men in decision-making; promoting women’s leadership potential.

It is proposed to evaluate the characteristics of the inclusion of gender components on a scale: “1” – one-time implementation attempt; “2” – implementation of some elements (gender tools/ approaches); “3” – the beginning of system implementation; “4” – moderate implementation; “5” – full implementation. The gender maturity assessment model is presented in Table 1.

Table 1

Gender maturity assessment of organizational system

Elements of organizational capacity		Gender-sensitive characteristics of organizational maturity
Conformity to the principle 1: “Gender equality at the workplace”		
1	2	3
1. Mission and Strategic Planning	Strategic planning	The strategic plans of the organization provide for a balance between productive (career development) and reproductive work.
	Operational planning	The organization includes additional training and fellowship programs for women (especially in the “male” areas) in the operational planning. There is the possibility of flexible working hours for staff.
2. Management structure and style of administration	Top management responsibilities	The organization considers gender expertise in job descriptions of decision makers (DM).
	Administrative efficiency	The organization provides a direct channel of communication between the staff and the governing body by the person responsible for gender development.
	Intra-organizational communication	Top management encourages managers to seek gender-balanced decisions in labor remuneration of staff.
	Management styles and leadership	Creating equal opportunities for professional realization of staff. The organization observe gender justice in decision-making about the participation in professional certification, development of leadership skills. The organization develops additional bonuses for employees who have specific gender needs (medical care, child care, elderly, sick family members). Auditing of jobs for availability and (or) the likelihood of gender violence is carried in the organization.
3. Adaptability	Monitoring and evaluation of programs	There is a regular audit of the HR policy and labor remuneration system to identify gender imbalances.
	Monitoring and evaluation of the organization	There is a regular audit of the HR policy and labor remuneration system to identify gender imbalances. Safety assessment of women workplaces (during business trips, working with partner organizations) is carried out. The incidents of workplace-related gender discrimination are analyzed.
	The use of monitoring and evaluation results in decision-making processes	The organization carries out recruitment of staff on the basis of gender monitoring of jobs. The measures to integrate the results of monitoring in the policy of compensations and (or) bonuses are taken.
4. Partnership and cooperation	Relations with partners	The organization is in contact with employment agencies, independent contractors, business partners, who are guided by the principles of gender responsibility.
5. Role in the field	Dissemination of knowledge and information	The organization provides training/retraining of all staff to acquire gender competencies.
6. Provision of services	Development programs	The organization is guided by a gender balance of labor resources involved to the development of programs.
	Communication strategy	The organization is able to detect gender discrimination in information announcements about employment of workers. The HR-strategy is developed on the basis of databases: “Gender interests and career goals of personnel”, “Gender barriers in professional career”. The organization demonstrates the gender sensitivity in all the news reports.
7. Financial sustainability and resource mobilization	The internal fundraising ability	The organization identifies a gender-balanced resource for fundraising. The staff equally, both women and men, shall be attached to cost management processes of projects and programs.
Conformity to the principle 2: “Gender-balanced management and leadership”		
1. Mission and Strategic Planning	Mission	The organization takes into account gender diversity of labor potential.
	Strategic planning	Strategic plans are developed with the participation of all stakeholders, avoiding gender-based discrimination.
	Operational planning	The organization provides women with the opportunity to influence the development of the action plan.

1	2	3
2. Management structure and style of administration	Top management responsibilities	The principles of gender diversity are considered in the Charter of the organization, the allocation of leadership positions of top management.
	Administrative efficiency	Evaluating the effectiveness of managers is based on the interdependence of “methods of work – results” in compliance with the principle of gender justice.
	Intra-organizational communication	The organization implements measures to prevent gender-based discrimination in the career advancement of staff.
	Management styles and leadership	The organization uses the methods, tools and concrete actions to attract women into the top management, DM. The organization chooses tactics which allow to delegate authority and responsibility for decision-making to both women and men. Gender partnership in teamwork is encouraged.
3. Adaptability	Monitoring and evaluation of the organization	The organization continuously monitors the gender composition of top management, DM.
	The use of monitoring and evaluation results in decision-making processes	The organization regularly collects, analyzes gender-segregated data to identify “weaknesses” in management and management style.
	Monitoring the environment of the program	The staff audit system contains information on the extent of introduction of the principles of gender equality and how it is integrated into the implementation of programs, gender initiatives.
4. Partnership and cooperation	Relations with the national government	The organization establishes relationships with government agencies entrusted with the authority of policy implementation to ensure equal rights and opportunities for women and men.
	Relations with local government	The organization has regular contacts with local authorities by joining regional programs to ensure equal rights and opportunities for women and men.
	Relations with the private sector	The organization cultivates relations with business, which implements social responsibility policy (including non-discrimination, empowerment of women).
	Public Relations	The organization has a partnership with non-governmental public organizations (NGOs) with experience (“best practices”) in implementation of projects to achieve gender equality.
5. Role in the field	Leadership in the field	The organization demonstrates the ability to be active in the assigned gender strategies.
	Role in capacity building	The system of institutional levers and assets (including brand, technology, staff, finance) is used to support initiatives on gender equality.
	Dissemination of knowledge and information	The organization informs all staff about their rights and strengthening of non-discrimination policies.
6. Provision of services	Knowledge in the field	The organization has clearly defined gender dimensions in its activities, and experience with them.
	Service quality standards	The organization has formal standards of gender-sensitive services according to external practices, guidelines or national, international standards.
	Development of programs	The organization demonstrates the ability to apply gender tools for the development of new programs.
	Communication strategy	All personnel of the organization are informed about gender-sensitive decision-making methods. The organization holds forums where employees can express their views on how the implementation of gender equality principles influenced their performance and implementation in general.
	Media strategy	Gender culture in public statements of top management, as well as informational materials (print, advertising, web-site).
Conformity to the principle 3: “Gender-just organizational processes”		
1. Mission and Strategic Planning	Strategic planning	The organization integrates gender principles in the processes of developing its services.
2. Management structure and style of administration	Top management responsibilities	The organization develops processes of detection, elimination, prevention of gender discrimination.
	Intra-organizational communication	The organization work is based on the principles of standardization of processes that take into account the principles of gender equality.
	Management styles and leadership	Measurement, evaluation, analysis of the interdependence of performance and sex of workers. The organization uses gender indicators: the number of women participating in training programs; the number of women who receive offers of employment and career development; the number of women who refused positions and why.

Continuation of Table 1

1	2	3
3. Adaptability	Monitoring and evaluation of programs	The organization uses gender methods and tools for project management.
	Monitoring and evaluation of the organization	The organization evaluates the gender competence of personnel, their capacity to integrate gender approaches to organizational processes.
	The use of monitoring and evaluation results in decision-making processes	The organization uses gender monitoring data for specific projects to develop solutions from strategic planning to budgeting.
4. Partnership and cooperation	Relations with local government	The organization interacts with stakeholders to ensure gender equality and provides advocacy within local government.
	Membership in regional/national associations	The organization increases its capacity through the use of collective and individual membership in international, national associations of gender orientation.
5. Role in the field	Dissemination of knowledge and information	The organization is able to generate knowledge and information on gender equality and women's issues.
6. Provision of services	Focusing on the needs and attracting customers	The organization develops services with regard to gender needs and collects information on customer satisfaction through various gender tools.
	Service quality standards	The organization uses the gender-segregated statistics and gender indicators in reports and assessments of the project.
	Development of programs	The organization demonstrates the ability to elaborate upon existing programs using GM technology.
	Media strategy	PR-strategy exists for each gender group coverage and is periodically updated.
7. Financial sustainability and resource mobilization	Fundraising strategy	The organization has a gender-sensitive fundraising strategy, including various funding sources of the gender component of the projects.
	Diversification of funding sources	The organization has various types and sources of funding due to the ability to carry out gender-sensitive budgeting.
Conformity to the principle 4: "Promoting equal involvement of women and men in decision-making"		
1. Mission and Strategic Planning	Mission	The organization's mission is consistent with the principles of gender equality and empowerment of women.
	Strategic planning	The organization develops specific measures for equal participation of both women and men in public life, as well as the elimination of all forms of discrimination and exploitation.
2. Management structure and style of administration	Administrative efficiency	Top management correlates a gender targets and actively encourages the organization management to achieve them.
	Management styles and leadership	All staff maintains the policy of gender discrimination. Top management demonstrates a policy of gender culture, protection of women from sexual harassment and violence. Support of work-women participation in public events.
3. Adaptability	Monitoring and evaluation of programs	The organization is involved in gender monitoring of projects and programs.
	Monitoring and evaluation of the organization	The organization carries out constant self-evaluation in terms of its impact on the market and gender equality promotion.
	The use of monitoring and evaluation results in decision-making processes	The organization uses the information on gender issues (including gender gaps, discrimination and violence) to plan their work.
4. Partnership and cooperation	Relations with the national government	The organization works with government, engaging in activities to eliminate gender discrimination.
	Relations with local government	The organization works with local authorities, engaging in activities to eliminate gender discrimination.
	Relations with other competitors	The organization collaborates with other companies within gender projects and programs.
	Membership in regional/national associations	The organization promotes the active participation of women in regional, national and international campaigns or forums.

1	2	3
5. Role in the field	Leadership in the field	The organization is able to mobilize companies to work together on gender equality.
	Role in capacity building	The organization supports and encourages workwomen to their active participation (especially as models for young people) and promotes their contribution to the development of the organization.
	Promotion of the field	The organization is involved in various activities to support gender equality and initiates such activities.
	Dissemination of knowledge and information	The organization supports the practice of sharing information on “best gender methods” with other organizations, local governments, private sector organizations, NGOs.
6. Provision of services	Knowledge in the field	The organization is acknowledged by other organizations and other stakeholders as a resource, an expert, a leader in gender mainstreaming.
	Focusing on the needs and attracting customers	The organization knows how to satisfy gender needs of target groups and has relevant experience.
	Development of programs	The organization is able to create effective projects and programs that meet the gender needs of stakeholders.
	Media strategy	Media strategy provides for coverage of the organization’s commitment to the implementation of gender equality principles.
7. Financial sustainability and resource mobilization	Fundraising strategy	The organization has the support of organizations whose mission involves gender equality promotion.
	Diversification of funding sources	The organization demonstrates the ability to participate in projects and programs that provide for funding of gender-oriented activities.
	Mobilizing local resources	The organization carries out mobilization of local resources in compliance with the principles of gender equity.
Conformity to the principle 5: “Promoting women’s leadership capacity building”		
1. Mission and Strategic Planning	Strategic planning	The organization seeks to minimize or eliminate any barriers to women’s leadership development.
	Operational planning	The organization helps women in career advancement, recruits staff on the basis of gender diversity (especially in decision-making processes).
2. Management structure and style of administration	Top management responsibilities	Top management has the required gender sensitivity, allowing women to take up leadership positions.
	Administrative efficiency	Top management reviews the results of gender audits, identifies potential leaders and encourages them to management initiatives of the organization.
	Management styles and leadership	The organization uses gender recruitment methods, promotes the appointment of women to senior positions. The organization actively integrates “women’s views” in organizational development policies. There is a women’s leadership development strategy (training and mentoring).
3. Adaptability	Monitoring and evaluation of the organization	Internal self-reflection with the participation of workwomen occurs regularly. The progress in the development of women’s leadership is measured.
4. Partnership and cooperation	Relations with the national government	The organization has regular contacts with national authorities entrusted with the power to improve opportunities for women.
	Relations with local government	The organization has regular contacts with the local authorities as part of programs to promote women’s leadership (e. g. the annual contest “Woman of the Year”).
	Relations with other competitors	Participation in external training and (or) activities to ensure gender equality and women’s rights. Partnerships with organizations working to improve the status of women.
	Membership in regional/national associations	The organization establishes relationships with professional associations and uses opportunities for greater representation of women in top management.
5. Role in the field	Role in capacity building	The organization provides services to other companies for the development of women’s leadership.
	Dissemination of knowledge and information	The organization encourages women to take up non-traditional (“male”) areas by providing access to career information and training programs designed specifically for them.
6. Provision of services	Knowledge in the field	The organization is convinced that women should be represented in top management and are an investment resource of the organization.
	Focusing on the needs and attracting customers	The organization provides priority to investments that contribute to the advancement of women, particularly in non-traditional (“male”) areas.
	Development of programs	The organization is able to carry out projects and programs aimed at women’s empowerment.
7. Financial sustainability and resource mobilization	Fundraising strategy	Involving organizations (financing activities) that support the women’s career development programs.

The presented estimation model of gender maturity of organizational processes was developed as a result of integration of two dimensions: organizational capacity (seven system blocks) and gender sensitivity (five principles) of companies. Further decomposition of administrative processes for specific projects and programs can be carried out on the methodological platform of the project management office.

Project Management Office (PMO) is a special organizational unit that is responsible for the centralized and coordinated project management [17]. The issue of the functioning of Gender-responsible Project Management Office (G-PMO) becomes relevant in circumstances where the gender-sensitive factor of projects and programs is significant (Fig. 2) [18, 19].

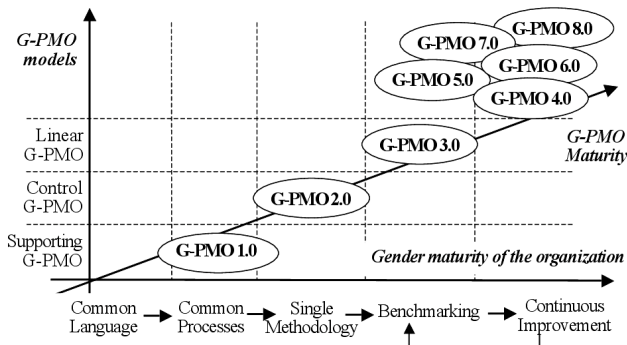


Fig. 2. Maturity models of gender-responsible project management office

The presented G-PMO models demonstrate the range of the functional responsibility from advisory support for the project (G-PMO 1.0) to the constant introduction of the best gender practices (G-PMO 3.0..G-PMO 8.0...).

6. The discussion of modeling results of gender maturity evaluation

The cognitive model of gender maturity of the project and program management system allows setting the “condition as is” and select/plan the actions necessary to move the system to a higher level (Fig. 3).

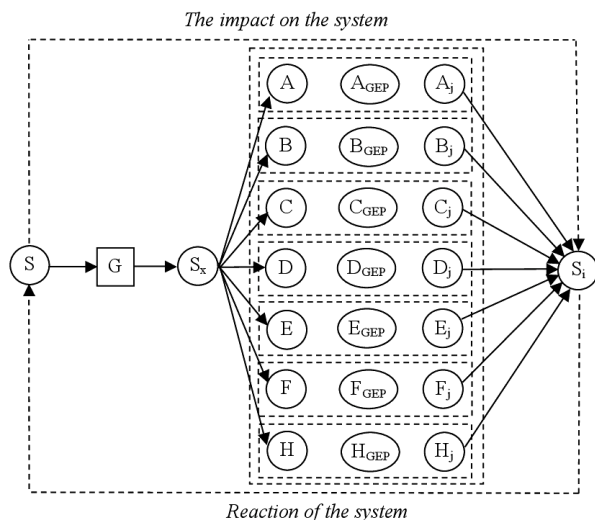


Fig. 3. The cognitive causal model of gender maturity of the project and program management system

In Fig. 3, S – complex organizational and technical project and program management system;

S_x – complex organizational and technical project and program management system, located on the *x* level of gender mainstreaming maturity;

S_i – complex organizational and technical project and program management system, in which there were changes (in gender context) during the *i* period;

G – gender content (dimension) of the project and program management system component of the project;

A – mission and strategic planning of the project and program management system;

A_{GEP} – conformity of the mission and strategic planning of the project and program management system to GEP;

A_j – assessment of conformity of the mission and strategic planning of the project and program management system to GEP;

B – management structure and leadership style of the project and program management system;

B_{GEP} – compliance of the management structure and style of the project and program management system with GEP;

B_k – conformity assessment of the management structure and style of the project and program management system to GEP;

C – project and program management system adaptability;

C_{GEP} – project and program management systems adaptability according to GEP;

C₁ – adaptability assessment of the project and program management system according to GEP;

D – capacity of the project and program management system to partnership and cooperation;

D_{GEP} – capacity of the project and program management system to partnership and cooperation according to GEP;

D_m – assessment of capacity of the project and program management system to partnership and cooperation according to GEP;

E – role of the project and program management system in the field;

E_{GEP} – role of the project and program management system in the field according to GEP;

E_n – assessment of the role of the project and program management system in the field according to GEP;

F – service quality of the project and program management system;

F_{GEP} – service quality of the project and program management system according to GEP;

F_p – assessment of service quality of the project and program management system according to GEP;

H – financial capacity and resource mobilization of the project and program management system;

H_{GEP} – financial capacity and resources mobilization of the project and program management system according to GEP;

H_q – assessment of financial capacity and resource mobilization of the project and program management system according to GEP.

The objective function describing gender maturity of the project and program management system takes the form of (1)–(8):

$$\Delta G = \sum_{j=1}^{j'} \sum_{k=1}^{k'} \sum_{l=1}^{l'} \sum_{m=1}^{m'} \sum_{n=1}^{n'} \sum_{p=1}^{p'} \sum_{q=1}^{q'} (A_j + B_k + C_l + D_m + E_n + F_p + H_q) \rightarrow \max, (1)$$

$$A = \{A_1, A_2, \dots, A_j\}, j = \overline{1; j'} \tag{2}$$

$$B = \{B_1, B_2, \dots, B_k\}, k = \overline{1; k'} \tag{3}$$

$$C = \{C_1, C_2, \dots, C_l\}, l = \overline{1; l'} \tag{4}$$

$$D = \{D_1, D_2, \dots, D_m\}, m = \overline{1; m'} \tag{5}$$

$$E = \{E_1, E_2, \dots, E_n\}, n = \overline{1; n'} \tag{6}$$

$$F = \{F_1, F_2, \dots, F_p\}, p = \overline{1; p'} \tag{7}$$

$$H = \{H_1, H_2, \dots, H_q\}, q = \overline{1; q'} \tag{8}$$

where j – quantitative assessment of conformity of the mission and strategic planning of the project and program management system to GEP, $j = \overline{10; 50}$; k – quantitative assessment of conformity of the management structure and leadership style of the project and program management system to GEP, $k = \overline{16; 80}$; l – quantitative assessment of adaptability of the project and program management system according to GEP, $l = \overline{13; 65}$; m – quantitative assessment of capacity of the project and program management system to partnership and cooperation according to GEP, $m = \overline{15; 75}$; n – quantitative assessment of the role of project and program management system in the field according to GEP, $n = \overline{11; 55}$; p – quantitative assessment of service quality the project and program management system according to GEP, $p = \overline{18; 90}$; q – quantitative assessment of financial capacity and resource mobilization of the project and program management system according to GEP, $q = \overline{7; 35}$.

Restrictions of the objective function GM of maturity of the project and program management organization are shown in the Table 2.

The level of gender maturity of the project and program management system is defined as:

$$G.Maturity = \frac{\partial S_{x+1}}{\partial S_x} \tag{9}$$

The overall result can be integrated as follows:

1 level of gender maturity (90–179 points) – knowledge of gender terminology. The organization has some knowledge on gender issues. At the same time, there is no understanding of how this gender knowledge can be applied in the project activity.

2 level of gender maturity (180–269 points) – mastering specific methods and tools by the project team. The organization feels the need for an in-depth development of gender-sensitive methodologies/tools as it considers gender mainstreaming as a way to improve project and program management.

3 level of gender maturity (270–359 points) – GM technologies integration into a unified project and program management system. The organization included GM in the architecture of the project activity at a level of corporate rules. Evaluation of the effectiveness of projects and programs involves gender-sensitive indicators. At the same time, all employees/departments are aware of the benefits of GM's, but do not understand the “subtleties” and continue to work in “the old fashioned way”. Probably there should be highly specialized training sessions to raise employees awareness and motivation for implementation of GM in the example of context-special projects and programs of the organization.

4 level of gender maturity (360–449 points) – GM technology benchmarking. The organization adheres to gender principles. Quality GM benchmarking is performed by G-PMO and is focused on the use of new GM technologies, analysis of how to integrate a gender perspective into the corporate culture of the organization. G-PMO is responsible for reviewing the correct information, a comparison with properly selected companies, projects, programs, quantitative and qualitative nature of the “best practice”.

5 level of gender maturity (450 points) – achievement of more gender-sensitive values of projects and programs. The organization follows ideas of GM practices benchmarking and continuous improvement. There may be opposition from staff or lack of support of top management or lack of authority of the gender office. Gender mainstreaming changes in the organization are supported by “pressure from the side of the beneficiaries” of projects and programs.

Table 2

Restrictions of the objective function of gender maturity of the project and program management system

Organizational development elements	The principles of gender equality				
	Gender equality in the workplace	Gender-balanced management and leadership	Gender-just organizational processes	Promoting equal participation of women and men in decision-making	Promoting development women's leadership potential
Mission and Strategic Planning	2...10	3...15	1...5	2...10	2...10
Management structure and style	4...10	4...20	3...15	2...10	3...15
Adaptability	3...15	3...15	3...15	3...15	1...5
Partnership and cooperation	1...5	4...20	2...10	4...20	4...20
Role in the field	1...5	3...15	1...5	4...20	2...10
Provision of services	2...10	5...25	4...20	4...20	3...15
Financial capacity and resource mobilization	1...5	–	2...10	3...15	1...5

Gender maturity model of the project management system is a diagnostic tool and is designed to assist companies in implementing and promoting the principles of gender. It will also allow establishing a baseline of gender maturity, and identifying areas of opportunities to improve the efficiency of project and program management, as well as:

- prioritizing areas for improvement (identifying any “bottlenecks” is the most important for the company, as well as identifying priorities for implementation);
- creating an action plan (developing a specific measurable action plan for each of the priority areas, ensuring that all members understand the action plan and ready are for responsible implementation);
- progress tracking (setting key performance indicators to compare with the plan, using evaluation tool at regular intervals is helpful);
- maintaining communications with stakeholders (key elements and indicators are transparent to stakeholders);
- use of resources (access to information on specific issues, best practices, research to understand how to improve the justice for women and men from “the final result” on the level “decision-making”).

The proposed assessment tool can be used to measure gender maturity for both specific units, and the organization as a whole. But for adequate evaluation of the results of the organization, it is necessary to correctly choose representatives who will carry out a gender sensitivity audit.

7. Conclusions

1. It was found that the development of project-oriented management is based on the of the management system ability to apply the gender mainstreaming approach. It is found that conceptual approaches to the formation of gender

sensitivity of the project and program management system are based on global principles of gender equality in a market economy (GEP).

2. The existing approaches to sustainable development of companies were analyzed. It is possible to define the principles which formed a “gender maturity of the project and program management system”. In terms of integration changes in the project-based management system towards the implementation of gender equality in the business environment, “gender maturity model of the project and program management system” is created to identify, control and monitor gender imbalances in the organization. Gender maturity of the organization is based on the integration of organizational capacity (seven blocks) and gender sensitivity (five principles).

3. Evaluation matrix of gender maturity of the organizational system, which is represented by elements of institutional capacity and gender-sensitivity characteristics of organizational maturity is developed. Further decomposition of management processes for individual projects and programs is seen on the methodological platform of creation and development of gender-responsible project management office. Cognitive model of gender maturity of the project and program management system was proposed. The application of this model allows determining the level of gender maturity “as is” and select the actions (elements of organizational development and (or) gender equality principles) required to move the system to a higher level. The basic level of gender maturity of the organizational system was established: “1 – knowledge of gender terminology”; “2 – mastering specific methods, tools by the project team”; “3 – gender mainstreaming technologies integration into a unified project and program management system”; “4 – gender mainstreaming technology benchmarking”; “5 – achieving additional gender-sensitive values of projects and programs”.

References

1. Fesenko, T. Gender Mainstreaming as a Factor of Project Management Maturity [Text] / T. Fesenko // Management of development of complex systems. – 2015. – Issue 23. – P. 5–10. – Available at: <http://urss.knuba.edu.ua/files/zbirnyk-23/1.pdf>
2. CMMI for Development: Version 1.3 [Text]. – Software Engineering Institute, 2010. – 482 p.
3. Organizational Project Management Maturity Model (OPM3): Knowledge foundation [Text]. – Project Management Institute, 2003. – 195 p.
4. Portfolio, programme & project management maturity model (P3M3): Version 1.0 [Text]. – Office of Government Commerce, 2006. – 77 p.
5. Kerzner, H. Strategic planning for project management using a project management maturity model [Text] / H. Kerzner. – New York: John Wiley & Sons, 2001. – 256 p.
6. Boure, L. Stakeholder Relationship Management: a maturity model for organisational implementation [Text] / L. Boure. – New York: Poutlodge, 2016. – 242 p.
7. Demir, C. Project Management Maturity Model (PMMM) in educational organizations [Text] / C. Demir, I. Kocabas // Procedia – Social and Behavioral Sciences. – 2010. – Vol. 9. – P. 1641–1645. doi: 10.1016/j.sbspro.2010.12.379
8. Pigosso, D. Ecodesign maturity model: a management framework to support eco design implementation into manufacturing companies [Text] / D. C. A. Pigosso, H. Rozenfeld, T. C. McAloone // Journal of Cleaner Production. – 2013. – Vol. 59. – P. 160–173. doi: 10.1016/j.jclepro.2013.06.040
9. Jia, G. Program management organization maturity integrated model for mega construction programs in China [Text] / G. Jia, Y. Chen, X. Xue, J. Chen, J. Cao, K. Tang // International Journal of Project Management. – 2011. – Vol. 29, Issue 7. – P. 834–845. doi: 10.1016/j.ijproman.2011.03.003
10. Lianyinga, Z. The Project Management Maturity Model and Application Based on PRINCE2 [Text] / Z. Lianyinga, H. Jingga, Z. Xinxinga // Procedia Engineering. – 2012. – Vol. 29. – P. 3691–3697. doi: 10.1016/j.proeng.2012.01.554
11. Domingues, P. Integrated management systems assessment: a maturity model proposal [Text] / P. Domingues, P. Sampaio, P. M. Arezes // Journal of Cleaner Production. – 2016. – Vol. 124. – P. 164–174. doi: 10.1016/j.jclepro.2016.02.103

12. Libby, J. The women's empowerment principles – equality means business [Text] / J. Libby, U. Wynhoven, L. Mills, L. Gula. – UN Women and the UN Global Compact, 2011. – 16 p.
13. Miller, K. Organizational communication: approaches and processes [Text] / K. Miller. – 6-th ed. – Cengage Learning, 2011. – 336 p.
14. Ferguson, K. E. The Feminist Case Against Bureaucracy [Text] / K. E. Ferguson. – Philadelphia: Temple University Press, 1984. – 304 p.
15. Gonjukova, L. V. Gendermejnstriming v organizaciji' [Text]: mater. IV mizhnar. nauk.-prakt. konf. / L. V. Gonjukova, G. G. Fesenko // Genderna polityka mist: istorija i suchasnist'. – 2015. – Issue 5. – P. 40–42. – Available at: http://gc.kname.edu.ua/images/docs/gengern_policy_2015/gend_policy_36.pdf
16. Gender Equality Principles [Electronic resource]. – Available at: <http://www.genderprinciples.org/principles.php>
17. Fesenko, T. G. Modeli i metody organizaciji' ofisu upravlinnja budivel'nyh proektamy [Text]: avtoref. dys. ... kand. tehn. nauk / T. G. Fesenko. – Kharkiv: HDTUBA, 2009. – 23 p.
18. Fesenko, T. G. Upravlinnja proektamy: teorija ta praktyka vykonannja proektnyh dij [Text]: navch. pos. / T. G. Fesenko. – Kharkiv: HNAMEG, 2012. – 182 p. – Available at: <http://eprints.kname.edu.ua/29445/1/2012%20Управл%20проект%20Фесенко%20ТГ.pdf>
19. Fesenko, T. G. Gendernyj ofis v informacijno-komunikatyvnyj platformi organiv miscevoho samovrjaduvannja [Text]: III mizhnar. nauk.-prakt. konf. / T. G. Fesenko // Informacijni tehnologii' ta vzajemodii'. – Kyiv: VPC «Kyivskij universytet», 2016. – P. 111–112.

Розроблено метод розрахунку плану формування одногрупних вантажних поїздів, який базується на використанні генетичних алгоритмів. Метод демонструє не лише високу точність розрахунків, але і забезпечує можливість урахування обмежень по пропускній і переробній спроможності об'єктів залізничної інфраструктури. Застосування даного методу в сукупності з використанням можливостей сучасних обчислювальних систем дозволить вирішувати задачу розрахунку плану формування поїздів для всього полігону залізниць України

Ключові слова: план формування поїздів, параметр накопичення, стохастично-комбінаторна оптимізація, генетичний алгоритм

Разработан метод расчета плана формирования одногруппных грузовых поездов, который базируется на использовании генетических алгоритмов. Метод демонстрирует не только высокую точность расчетов, но и обеспечивает возможность учета ограничений по пропускной и перерабатывающей способности объектов железнодорожной инфраструктуры. Применение данного метода в совокупности с использованием возможностей современных вычислительных систем позволит решать задачу расчета плана формирования поездов для всего полигона железных дорог Украины

Ключевые слова: план формирования поездов, параметр накопления, стохастическая-комбинаторная оптимизация, генетический алгоритм

UDC 656.2

DOI: 10.15587/1729-4061.2017.93276

DEVISING A METHOD FOR THE AUTOMATED CALCULATION OF TRAIN FORMATION PLAN BY EMPLOYING GENETIC ALGORITHMS

T. Butko

Doctor of Technical Sciences, Professor*

E-mail: uermp@ukr.net

V. Prokhorov

Engineer*

E-mail: vicmmx@gmail.com

D. Chekhunov

Postgraduate student*

E-mail: cdm2017@meta.ua

*Department of management of operational work
Ukrainian State University of Railway Transport
Feierbakha sq., 7, Kharkiv, Ukraine, 61050

1. Introduction

The process of accumulation of railcars and formation of trains plays a key role. Duration of the accumulation of one train depends on the capacity of railcar traffic of the given purpose. Basic indicators in the process of accumulation of trains are the total railcar-hour accumulation for the given

direction per 24 hours, average downtime of one railcar during accumulation, mean time of train accumulation.

To accelerate the process of accumulation of trains, the priority of dispatch of trains are used, which include the final groups of railcars. They also provide for arrival of large groups of railcars by the end of the process of train accumulation. They also form trains with increased weight. In addi-