

Staffing of Innovation Activities

L L Nadreeva¹, V V Melnitchnov¹, V A Abramov¹

¹Federal State Budgetary Educational Institution of Higher Education «Kazan National Research Technical University named after A.N. Tupolev–KAI», st. Karl Marx, 31, Kazan, Rep. Tatarstan, 420111, Russian Federation

E-mail: abramov@re-audit.ru

Abstract. The article covers a mechanism of involving personnel in the implementation of strategic plans of production processes innovation, the sources of formation of the regional system of personnel support of innovation. It justifies proposals for the use of multidisciplinary educational project teams (EPT) for updating the previously acquired knowledge and skills. It proposes tools for measuring the integrated level of synergetic effect of EPT.

1. Introduction

Innovative development of the regions and the country as a whole, modernization of the economy, improvement of production processes at enterprises are impossible without creating a regional system for training highly qualified personnel and involving staff in the implementation of strategic plans for innovating production processes. In tackling the problem of staffing the innovation activities, the role of the lower level (enterprises) is particularly prominent. It is at this level that the mechanism of involving personnel in the implementation of strategic plans for the innovation of production processes should be created and function. The elements of the mechanism of involving personnel in the implementation of strategic plans for innovating production processes and their relationship are presented in figure 1.

The quality of human resources employed to an enterprise primarily depends on the system of training highly qualified personnel. In planning the parameters of this system, it is necessary to take into account both the requirements for the level of professional education and the identity of employees, who should be motivated, first of all, for creativity, initiative and perseverance in the introduction of innovations. Not the least among these criteria is the ability of an employee to effectively interact with labor process colleagues with a different profession, in order to persuade them to find comprehensive solutions to all aspects of urgent problems.

One of the main problems of innovative activity in production enterprises and increasing their value is the shortage of highly qualified personnel, or rather, managers and teams capable of solving complex problems effectively. To overcome this situation, it is advisable to use targeted team training, which at low costs significantly reduces time and risks of developing and introducing innovations. Recovery of the relatively small costs of targeted training is provided by an increase in turnover and profits, if at least some of the planned innovative projects were effectively implemented.

Analysis of the publications shows that at present there is practically no scientifically based holistic system of staffing for the management of innovative activities of enterprises that meets dynamically changing requirements, which determines the relevance of the research topic.

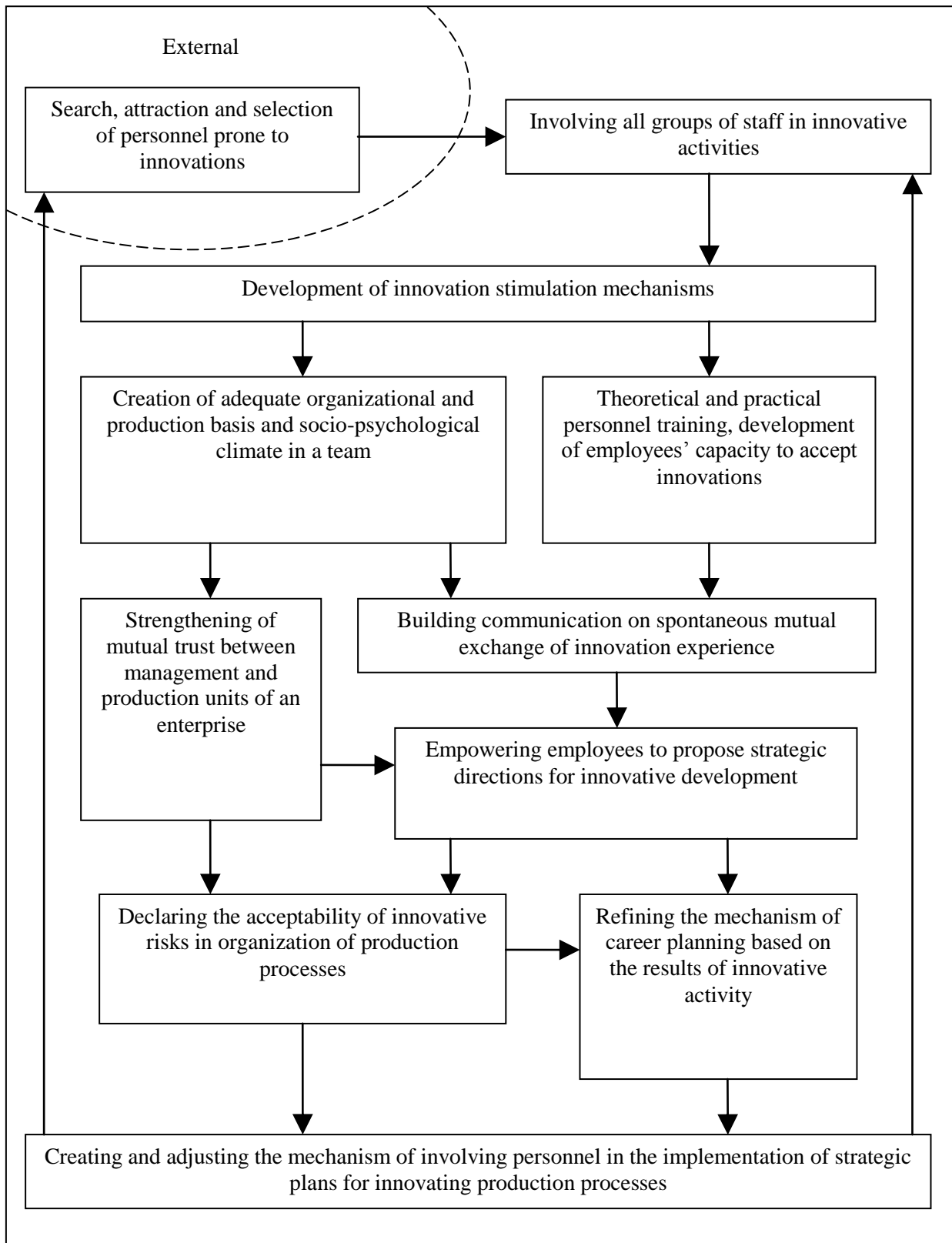


Figure 1. The mechanism of involving personnel in the implementation of strategic plans for innovating production processes.

2. Literature review

The issues of staffing innovative activities are considered in the works of Torrington D, Parker G, Davankov A Yu, Sokolov K O, Mingaleeva G F, Shlilberg S A, Irikova V A, Mametova A V and Tarasenko O S, Gavrilova A, Prikhach A Yu and other authors.

Table 1. Classification of sources of formation of the regional system of personnel support for innovation [1].

№	Classification criteria	Classific. groups of innovations	Sources of formation of the regional system for staffing innovation
11	Original location of human resources	Internal	Training of specialists. Retraining specialists. Employing qualified specialists, who have gone to other sectors of the regional economy.
		External	Leasing (renting) specialists. Migration and relocation of specialists.
22	Responsiveness of employment	Employing in a short time	Training of specialists. Retraining of specialists. Employing qualified specialists, who have gone to other sectors of the regional economy. Leasing (renting) specialists. Migration and relocation of specialists.
		Over a long period of time	Training of specialists.
33	Duration of employment	Temporary	Retraining of specialists. Employing qualified specialists, who have gone to other sectors of the regional economy. Leasing (renting) specialists. Migration and relocation of specialists.
		Continual	Training of specialists. Relocating specialists.
44	Form of employment	Collective	Leasing (renting) specialists. Relocating specialists. Retraining of specialists.
		Individual	Training of specialists. Retraining of specialists. Employing qualified specialists, who have gone to other sectors of the regional economy. Migration and relocation of specialists. Leasing (renting) specialists.
55	Skill level of human resources	High	Employing qualified specialists, who have gone to other sectors of the regional economy. Leasing (renting) specialists. Migration and relocation of specialists.
		Low	Training of specialists. Retraining of specialists.

Mingaleev G F notes that innovative behavior is in close connection with the innovative way of thinking — an active way to perceive and evaluate objects of the external world, which is inherent in the human person, associated with the need to constantly develop and master new models of interaction with them. Of particular importance is the development of innovative culture, which is associated with changing the style and methods of personnel management as well as transforming the latter into a human resource management system. While the methods of innovative personnel management are followed, a properly organized HR management system contributes to the creation of innovative thinking among employees, which turns human resources into an actor of innovation and competitiveness.

Quality of the employed human resources depends not only on the system of training highly qualified personnel, but also on sources of formation of the regional system of staffing the innovation activities (Table 1), which is considered in the work of Davankov A Yu, Sokolov K O.

Sokolov notes the increasing importance of innovation in the development of modern organizations and the increasing role of team methods for managing innovative projects.

Mametov A V and Tarasenko O S draw attention to such a problem as the shortage of highly qualified personnel, or rather, managers and teams capable of effectively solving complex tasks for implementation of innovative activities.

3. Problem statement

The study of the mechanism of involving personnel in implementation of strategic plans for innovation of production processes and sources of formation of a staffing system for innovative activities revealed that one of the sources of satisfying the need for human resources for implementing innovative projects may be a fairly large social group, whose subjects have higher technical education, employed in jobs other than their specialties, want to return to the specialty they studied for, provided they receive certain additional training that updates their knowledge and skills.

In this regard, there is a need to:

- clarify the conceptual apparatus used to indicate processes of changing a profession and ways to return to it.
- substantiate feasibility of widespread introduction of the method of multidisciplinary project training (MPT) in educational practice of technical universities.
- develop tools for measuring integral level of the synergistic effect of educational and professional groups.

One of the sources for satisfying the need for human resources for the implementation of innovative projects can be a rather large social group, the subjects of which have a higher technical education; they are employed in jobs other than their specialties, but they want to return to the specialty they studied for, provided they receive certain additional training that updates their knowledge and skills. One of the forms of such updating can be multidisciplinary educational project teams (EPT). Needless to say, the project form of training as such in this case is highly relevant, because the innovative activity itself has a quite obvious project nature. At the same time, the obviousness of this fact does not negate the need for a qualified discussion of the advantages of a multidisciplinary approach to organizing such training and the obstacles arising along this path.

However, before proceeding to discussing the causes and consequences of changing professions, developing specific recommendations for improving the efficiency of utilizing working potential of workers who have changed their profession and describing the appropriate mechanism for their retraining in educational project teams, it is necessary to remove the difficulties associated with lack of clarity and consistency in terminology. In other words, the discussion should begin with a review of the conceptual apparatus, with the terms that are commonly used to denote the process of changing profession and ways of returning to it. One of these terms is reprofessionalization.

Some researchers understand reprofessionalization as the process of changing occupation, which is accompanied by acquisition of new professional knowledge and skills, which could equally well be expressed by another, albeit not so melodious, term professionalisation. Our irony about the equal

unsuccessfulness of this hypothetical terminological innovation is associated with the apparent ambiguity of the preset “over-”, which means not only change, but also excessiveness of actions.

Another option to eliminate confusion would be to introduce the concepts of primary and secondary reprofessionalization — in its connection with primary and secondary professionalization.

Primary professionalization is the process of becoming a specialist. It includes acquisition of professional skills required for a successful start of a professional activity, namely, acquisition of a specialty. An indicator of successful completion of the primary professionalization stage is completion of professional education and obtaining professional qualifications.

Analogically, primary reprofessionalization could intend a change in profession immediately after graduating from professional education and obtaining professional qualifications, which is not only a very common phenomenon nowadays and therefore requires research, but also an indispensable prerequisite for secondary reprofessionalization.

Secondary professionalization is generally accepted to be a transformation of a specialist into a highly qualified professional, formation of a special professional skill, development of a creative approach to a professional activity, and not necessarily within a framework of an initially acquired profession. This is the formation and development of professionalism directly through work experience on the basis of accumulation and use of practical and activity-oriented knowledge. In this case, it would be logical to call the employee's return to the previous profession after the secondary professionalization as the secondary reprofessionalization.

However, in our opinion, in order to simplify the vocabulary and to avoid excessive formalization of the conceptual apparatus to refer to the primary reprofessionalization, it is preferable to use the traditional term "retraining". And by reprofessionalization we mean only the process of returning to the previous profession, obtained as a result of primary or secondary professionalization, through "recovery" training and additional training, which updates their knowledge and skills [3].

The second key term in the framework of the declared topic is the multidisciplinary project preparation. Etymological aspect of the term seems quite clear ("multi" — many), but his understanding is not as straightforward and apparently requires a few comments. It is our submission, that multidisciplinary project training (MPT) within the framework of primary professionalization is a method of reinforcing and developing the main and related professional competences by senior students of technical Universities in the process of joint development of primary project documentation (design, technological, marketing, organizational and productive, financial and economic, legal, etc.), then preparing a business plan of an innovative project commissioned by an enterprise.

In both conceptual and scientific and applied respects, the MPT method is most thoroughly justified as a tool of primary professionalization. The methodology of project training has been practiced in technical higher education for many decades and has proved its effectiveness in practice as an indispensable tool for the formation of professional competencies of a future engineer [4]. At the same time, collective implementation of educational projects by groups of students, with more or less success imitating the activities of a design or technology agency, is also widely spread. There is seemingly nothing new to expect in this field, but with the granting of the status of technical universities to large technical colleges, one of the goals of which was proclaimed the "humanitarization" of engineering education, a new powerful potential of project training was formed. It has become possible for project groups to include not only engineers and technologists, aerodynamicists and structural analysts but also economists, marketers, environmentalists, lawyers, PR-managers and other specialists, whose training was mastered in the Humanities department. The foundation, ensuring the efficiency of such a student team, is a technical task of the employer to develop a full-fledged innovative project under the guidance of academic staff of specialized departments and mentoring consultants from the enterprise. The practical successes achieved in the course of numerous experiments conducted at the initiative of our Department, including at the interuniversity level, evidences not only to the expediency of widespread introduction of the MPT method in the practice of educational activities of technical universities, but also make us think about

its expansion beyond the process of primary professionalization, in particular – about the adaptation of this method to the problems of reprofessionalization.

In developing an investment project able to attract the attention of a real investor with participation of students or participants of courses for professional development, an integrated approach to a set of tasks is maintained, which, outside the framework of the MPT methodology, is perceived as aimed at achieving individual, autonomously existing goals. However, before proceeding to discuss its benefits and issues on the possible extent and ways of using the method of MPT in the process of reprofessionalisation, let us refer to the statistics. The study of Higher school of Economics and Russian Federal State Statistics Service provides information that only half of Russians with diplomas of higher education work in their specialty. And engineers are the least of all who work in the specialty. Among them, only 35% are arranged to work in the specialty, about 30% are employed in areas that do not require higher education.

The study used data from a survey of 270 thousand people aged 15-72 years, while the authors of the study argue that after the economic crisis, the structure of employment in the professions will not change. The statement is quite controversial, but not directly contradicting our reasoning.

The reason for the current shortage of engineering personnel is well known — many universities could not recruit students even for state-funded places and were forced to admit school graduates with poor grades. Interestingly, the reluctance to work in the profession until recently was demonstrated by all age groups of engineers. The engineers of the Soviet formation in the 90s retrained into shuttle traders, drivers, some of them became managers and do not want to return to their previous activities. Many of those engineers who received a diploma in the 2000s became workers — so low was the level of their training even when entering the University. With such assumptions, full-scale reprofessionalization, in our view, is not advisable. At the same time, we can talk about the policy of targeted reprofessionalization, which is possible under at least two conditions.

The first condition is the need for using human resources for innovation in the short term.

The second condition is the desire of an employee to return to the previously obtained profession.

Let us consider in more detail the cases that may encourage such a desire. One of the cases is related to the fact that the main part of university graduates is under the influence of the "grey" labor market, i.e. they get a job on their own, focusing on the economic benefits of the proposals, for example, the first salary of a university graduate in the trading network is bigger than the first salary of an engineer at an enterprise. Often the specialty obtained in self-employment is not considered. Employers (mostly companies with private ownership) are willing to pay a worker a higher salary for unskilled labor than a state enterprise for a qualified one. But the employer chooses an employee from a larger number of applicants and generally tend to set the high requirements. When filling any vacant position, preference is given to persons with higher education. This is beneficial to the enterprise: without spending a ruble (the education in a state university is state-funded), it has a sufficiently competent specialist in the prime of his intellectual and physical strength, which expands the potential of the enterprise. As for the employee, it takes 2-3 years of low-skilled labor or labor in a field different from his specialty to lose the skills and knowledge obtained in the university, gradually losing the capacity to work independently and creatively. For a creative person it usually causes a feeling of dissatisfaction with the current situation and awakens the desire to work in the former profession, which causes mainly positive emotions. In addition, he notices that his university colleagues in about a year after acquiring relevant experience in an enterprise start to have the same wage and begin to surpass the salary of a manager in a trading network. No less important is the fact that an employee of an enterprise can also make a managerial career in engineering or manufacturing, or even change the scope of activity when desired, going to the supply, sales, HR, economy, which greatly expands the possibilities of self-realization of a specialist with engineering education at the manufacturing plant.

Another situation may arise due to the fact that an employee cannot work at the previous job due to any force majeure: unsuitability (for example, loss of voice at work related to communication on the phone), staff reductions, etc.

The desire to return to the former profession usually arises in some subjects after communicating with their former colleagues who have successfully realized themselves in the profession. A survey conducted in Kazan National Research Technical University named after A.N. Tupolev showed that on average 10-15% of graduates who are not employed in the specialty obtained at the university would like to practice their specialty, provided that they will get an appropriate additional training.

The next important issue is the required volumes and possible sources of financial resources attracted for reprofessionalization as a part of the multidisciplinary project teams. Turning to this issue, it should be noted that business opportunities are reduced in times of crisis. At the same time, we believe that the costs of such reprofessionalization will be feasible for the region, since it is not a matter of mass retraining of graduates in traditional educational technology, but of reprofessionalization, and not large-scale, but targeted. In addition, the costs of reprofessionalization can be partially funded by the Federal budget via transfers to the budget of the Republic of Tatarstan, which is similar to the financing of the costs of advanced training.

The kind of professionalization and a well-formed educational project team will significantly affect the magnitude of cost [5]. If there is secondary professionalization and subsequent reprofessionalization in an educational project team, the cost of additional training will be significantly lower compared to the cost of the same training for workers who have received only traditional primary professionalization.

4. Practical relevance, suggestions and implementation results

The positive side of reprofessionalization of the workers who have received secondary professionalization may be the possible synergetic effect – when the primary specialty, for example, a heat power engineering graduate returns to his specialty after becoming "secondary professionalized" in the field of computer technology, and therefore already able to more effectively interact with computer technology professionals in educational project teams (EPT).

After all, the main distinctive feature of a specialist who has participated in a project training in multidisciplinary educational project teams is the ability to effectively interact with specialists of other professions in all spheres of economic activity of an enterprise and thus provide system solutions to their professional objectives in the development and implementation of large-scale innovative production projects.

As the first attempt to develop a tool for measuring the integrated level of synergetic effect of EPT, it is proposed to use a simple additive model, in which the components are relative (normalized) levels of reducing the time for solving typical project problems and the number of proposed erroneous interdisciplinary solutions. For example, we present the calculation of the level of integrated synergetic effect (LISE) of EPT for one of the student educational and research projects, which is presented in table 2.

Table 2. Initial data for calculating the level of integrated synergetic effect of EPT.

Indicators	Classification criteria.	Values
Time frame for the implementation (workdays)	Traditional educational project engineering team with outsourcing of marketing, design, estimate and other non-engineering tasks	56
	Multidisciplinary EPT	44
The number of rejected (incorrect) solutions	Traditional educational project engineering team with outsourcing of marketing, design, estimate and other non-engineering tasks	8
	Multidisciplinary EPT	3

$$LISE = [(56-44)/56 + (8-3)/8]/2 = [0,27+0,62]/2 = 0,49.$$

The maximum value of the LISE can be 1 (or 100%).

In more general terms, it is about the possibility of saving on modernization of the university's organizational infrastructure, the need for which is justified due to development of the MPT methodology, for example, in work. The problem of reconstructing the organizational and methodological bases of educational process under the MPT technology has a fundamental character, because it provides for the formation of the matrix organizational structure of the University in accordance with the project approach to the management of educational process, its intensification by shifting from a semester structure the academic year to bimestrial with a training schedule without examinations as well as the development of the Institute of real academic freedom of younger students as part of their pre-training [4].

As already noted, the peculiarity of reprofessionalization through the MPT technology is also the need for more careful selection of candidates for additional training groups, which requires developing and using appropriate tools. Thus, it is needed to comply with another condition. It is about a certain level of residual knowledge of a graduate and his skills. It can be assumed that the value of this level will vary depending on the specific tasks that the people wishing to return to the profession will solve in the future.

In particular, it is necessary to say about the problem of discreteness – qualitative changes in the primary qualification of an employee, which occur at certain intervals. All other things being equal, it is clear that the longer these periods of time between professionalization and reprofessionalization are, the lower the level of residual knowledge and the more difficult reprofessionalization are. Perhaps for some professions it makes sense to define specific values of critical time intervals, and then the problem of selection in additional training groups for certain categories of candidates will be solved almost automatically.

5. Conclusion

Multidisciplinary educational project teams are, in our opinion, an effective form of staff reprofessionalization. The work in such teams, in addition to formation and development of professional qualities, with appropriate organization and environment will contribute to formation and development of innovative abilities of managers and specialists also from the standpoint of their personal qualities. For managers, it is the ability to create a creative atmosphere in his team, the ability to motivate employees, high competence; for executives is support of innovations, providing staff with the necessary information, demonstration of a positive attitude to people, etc. With an appropriate organization of interaction between the University and an enterprise, a multidisciplinary educational project team can be a ready innovative team and become a base for supporters of transformation in the organization. An important condition is that the members of the group must be psychologically compatible with each other.

The main application of specialists who have received project reprofessionalization will be found in the aircraft industry, engineering, petrochemical complexes, as well as in other areas of national economy of the Republic of Tatarstan [6]. The final result of implementing the concept of additional project training of specialists in multidisciplinary educational project teams will be staffing of enterprises and organizations in the form of project-oriented teams of specialists with secondary and higher special education from various disciplines, who are able to solve the whole complex of tasks related to the development, production and promotion of innovative products in close cooperation with each other.

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