

## Use of the LMS Moodle for an Effective Implementation of an Innovative Policy in Higher Educational Institutions

<https://doi.org/10.3991/ijet.v15i13.14945>

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**Abstract**—This article considers the opportunities of using Moodle LMS (learning management system) tools to ensure the effective implementation of an innovative policy of the higher educational institution. In the framework of digital transformation of social space an important and relevant topic for higher educational institutions is the creation of high-quality information and communication environment, which shall correspond to the contemporary state of science and technology development, global educational standards and information society needs. The advantages of the Moodle system are studied. Moodle system provides for a comprehensive educational process through its extensive educational content, a system for control, monitoring and evaluating the knowledge quality. The authors compare the four-phased model of knowledge management with the capacities of LMS Moodle educational environment. The latter is capable of simulating professional actions in a virtual educational space that allows the university to train advanced specialists and ensure a high level of their professional skills based on hard and soft skills. The perceptive and cognitive attitude of university students and teachers towards the implementation of the LMS Moodle educational platform was researched. The research has brought out the subjective assessment model of the innovative process with clear meaningful factors of changes' perception. Such a model allows understanding the collective attitude to the university's policy and highlighting mental settings necessary for working with human resources within the social adaptation and diffusion of innovation. The synergy of technological and managerial innovations has been updated to ensure completeness and efficiency in presenting a professional educational product based on the LMS Moodle platform.

**Keywords**—Digital learning technologies; distance learning; innovative educational process; innovative policy; LMS Moodle tools.

## **1 Introduction**

Social needs contribute to the development of new requirements for the organization of vocational training and actualize providing a comfortable, democratic, and effective educational process [1]. Advanced innovative and communication technologies can realize modern demands within a fundamentally new approach toward the professional development of a future specialist, through a combination of the intellectual and competent resource of the educational environment and modeling of professional experience necessary for professional adequacy [2].

Nowadays in the society, there are the transformation of the educational paradigm and approaches to the organization of the learning process, which are facilitated by the emergence of new technological solutions and innovative digital opportunities. Learning Management Systems (LMS) together with Learning Content Management Systems (LCMS) now are important components of higher education and learning infrastructure of higher educational institutions [3].

The majority of higher educational institutions have already used the benefits of the Learning Management System (LMS), which can be adopted to current needs of vocational training [4] and generates new technological solutions, including mobile learning technologies that are becoming viable [5,6]. In addition, the development of international cooperation within education and science requires higher educational institutions to use unified electronic learning systems for ensuring the effectiveness of international cooperation [7]. LMS Moodle is an optimal technological solution for arranging the system of international exchange of knowledge and practical experience [8] that is affirmed by numerous scientific studies in leading universities in the world.

Moodle LMS is the most sophisticated and popular e-learning system with a multilingual interface. This is a learning platform developed to provide teachers, administrators and students with a single, reliable, secure, and integrated system for creating personalized learning space [9]. The capability of the system to create a learning environment, simulate group information flows and communication in the mode of joint interaction of the learning group is an important criterion for the implementation of an effective and complete educational cycle [10]. The application of the Moodle platform tools, involving the learning group into discussion, mutual assessment, reflection, interactive design forms an innovative component of the regular educational process in the microenvironment. The latter as a whole gives rise to the innovation trend and a fundamental competitive advantage of the educational structure in the vocational training market [11]. Thus, the world's leading higher educational institutions, keeping up with the times, are experimenting with the educational content and training courses, removing obsolete approaches towards the organization of the learning process and virtualizing professional practices to form applied competencies of future specialists [12].

The objective of the research is to examine the opportunities and perspectives of the application of Moodle LMS tools to achieve the effective implementation of the innovative policy of the higher educational institution.

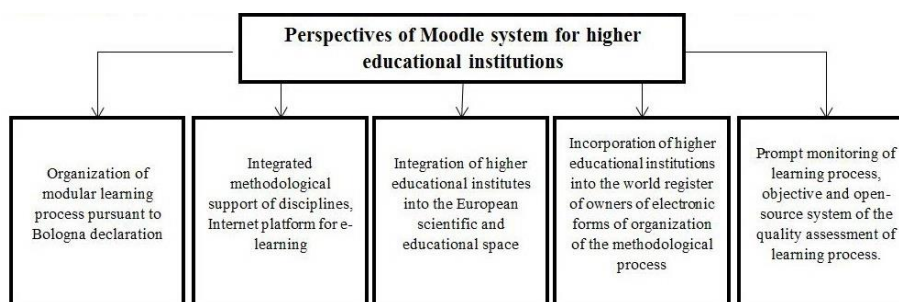
In view of the above-mentioned, the following tasks have been set out:

- To analyze the benefits of the Moodle system in providing a comprehensive learning process through extensive educational content, systems of control, monitoring and estimating the knowledge quality;
- To compare the four-phased model of knowledge management with the capabilities of the educational environment of LMS Moodle in the context of the formation of hard and soft skills among university students;
- To investigate the perceptive and cognitive attitude of students and teachers toward LMS Moodle implementation in the educational process;
- To study the collective attitude of students and teachers in terms of the policy of the higher educational institution and find out mental capabilities necessary for work with the human resource during a social adaptation and diffusion of innovation.

## 2 Theoretical Background

Moodle system is among innovative information and communication technologies (ICTs) that create a contemporary educational environment with a free access of the student to the educational content at any time and in any place. LMS Moodle is a centralized system for monitoring an objectively module-based environment for distance learning, taking into account the philosophy of “social constructivism”. Moodle is aimed to provide the [synchronous cooperation](#) of the teacher with the training group at the level of synergy and group development.

Moodle system provides a full-fledged learning process with an extensive learning content, systems of control, monitoring and assessment of the knowledge quality. LMS Moodle tools allow creating a comprehensive and vocational learning product that is required for integration processes of higher educational institutions and is a resource base for international relations and a joint external educational process (Fig. 1).



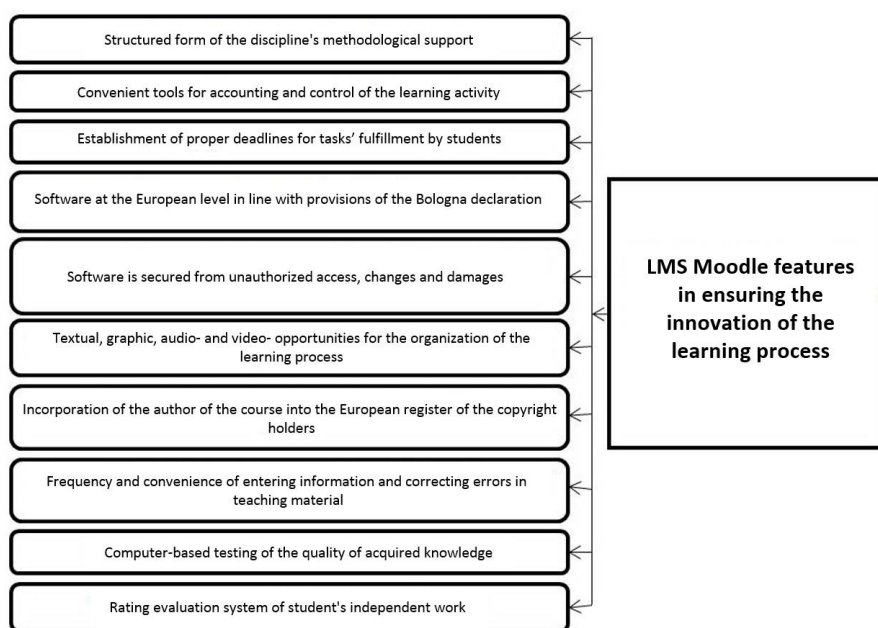
**Fig. 1.** Perspectives of Moodle system for higher educational institutions

Logically structured system means can provide quality training for qualified specialists. LMS Moodle is convenient in use for higher educational institutions because of its capability to integrate with academic resources, libraries and curricula.

Besides, the LMS Moodle-based university e-learning system allows integrating mobile technologies into educational processes and implementing the Mobile Learning Management System (MLMS). MLE-MOODLE (mobile learning engine “Moodle”) is an IT solution that renders an access to e-learning courses by using mobile devices and makes the educational process comfortable, democratic and interesting for a modern student; besides, it provides flexibility and satisfies a wide range of educational needs.

The implementation of innovative ICTs in the educational process ensures a competitive benefit for the university in the education due to the following aspects:

- Expansion of the information and educational space;
- Realization of the principle of continuous learning;
- Increase in the students’ population through distance learning;
- Formation of a high-quality comprehensive educational product;
- Extension of international relations;
- Incorporation into world register of owners of electronic forms of educational process organization;
- Cost optimization and rational use of the university infrastructure (Fig. 2).

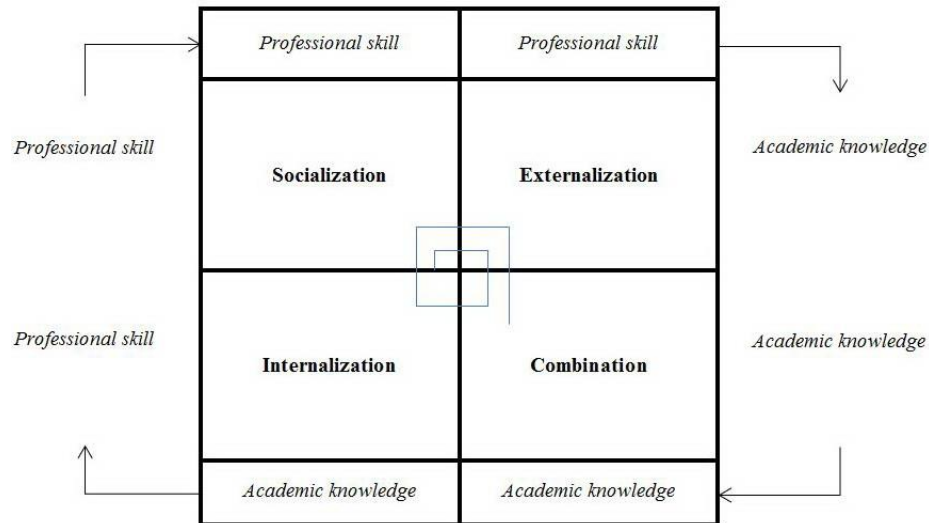


**Fig. 2.** Features in ensuring the innovation of the learning process

The environment, in which the student is staying and he/she interacts with, has impact on the development of his/her professional skills and competences. Thus, within current estimation of the digital transformation of the society and the global economic system for higher educational institutions, it is a very important and urgent

task to create a high-tech information and communication platform. The latter is to be in conformity with the modern state of science and technology development, world educational standards, and the needs of the information society.

If one regards the vocational training as the Knowledge Management System, the elaboration of a content and training path is becoming of great demand. Considering the form, in which the knowledge is demonstrated, the latter is split into tacit – professional skills, experience and explicit – systematization and formatting of technologies, models, ideas [13]. The latter makes up the four-phased model of knowledge management – SECI (socialization, externalization, combination, and internalization) or “Knowledge Spiral”. The latter reveals the form of knowledge transfer during the four phases such as socialization, externalization, combination, internalization through three levels of social aggregation, namely: individual, group and context (Fig. 3).

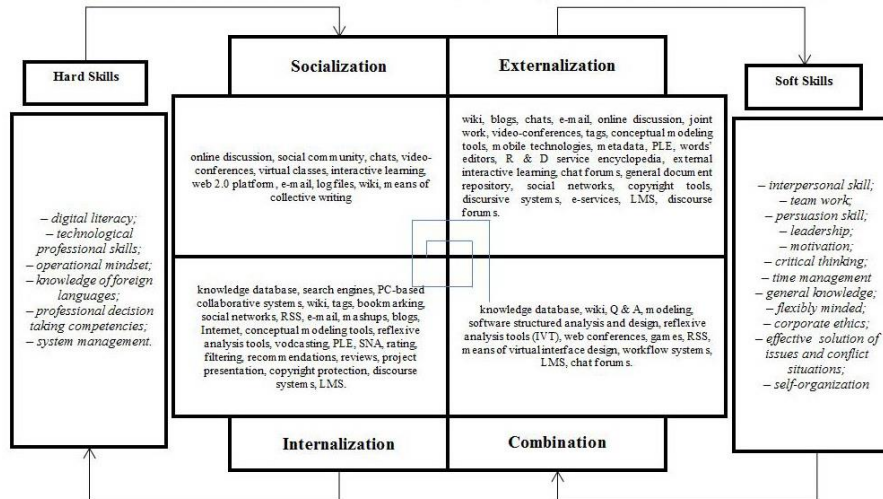


**Fig. 3.** “Knowledge Spiral” in professional skills’ formation

In fact, the “Knowledge Spiral” reflects knowledge spiraling from the individual to the community through converting from tacit knowledge into explicit one, their systematization and formatting based on the assumption that elaboration and dissemination of vocational knowledge are possible via social interaction of explicit and tacit knowledge.

Modeling of a virtual learning environment is a modern trend in the educational system and a necessary requirement for its evolution, taking into account the advanced achievements and capabilities of the information and communication sphere and global processes of society digitalization. Imitation of professional actions in the virtual educational space enables a contemporary higher educational institution to prepare advanced specialists and ensure a high level of their professional skills. Thus,

the authors compare the four-phased knowledge management model with the capabilities of digital technologies (Fig. 4).



**Fig. 4.** Spiral of digital opportunities in the development of “hard & soft skills” by students of higher institution

The SECI process in the vocational training comprises four phases of knowledge transformation:

- Socialization (from individual professional practical skills to group practical skills);
- Externalization (from professional practical skills to theoretical professional knowledge);
- Combination (from individual theoretical professional knowledge to systematic professional theoretical knowledge);
- Internalization (transformation of theoretical professional knowledge into professional skill).

This process is crucial for innovative learning, as it is one of the few approaches that focuses on the interaction between professional practical skills (professional improvisation) and theoretical professional knowledge.

The four-phased SECI knowledge management model reflects the full cycle of professional self-realization of the specialist, and offers for the student the best technology for professional training. The distance learning based on the LMS Moodle in combination with a competent approach that aims at achieving educational results and focuses on the formation of skills to act professionally in non-standard situations and apply acquired professional knowledge, demonstrates excellent vocational training.

The efficiency of the innovative policy of the higher educational institution has been significantly determined by relevant social and psychological features of

participants of the innovative process and their competencies in combination with new ideas and technologies. On the one hand, this is a capacity to generate new ideas (creativity) and, on the other hand, this is the capacity to accept, adapt, inflate and implement (innovation).

Considering the peculiarities of SECI knowledge transformation process in the vocational training, the LMS Moodle implementation is one of the real means of increasing the quality of specialists' training. Moodle system implementation for students enables freely and independently organize the learning process, in particular the training at any time and in any place that is especially important for working students. The use of modern communication means with the teacher and an individually oriented approach in training make the educational process modern and convenient for today generation that is more informative than the previous one, have impact on the ease and frequency of acquiring the knowledge, skills and capabilities that have been learnt.

The success of the teacher's innovative professional activity is determined by his/her understanding of the importance of educational innovations in order to realize contemporary quality requirements related to the learning process. However, usually attracting of the teacher of higher educational institution to the innovation process occurs spontaneously without taking into account his/her readiness for creative innovative activity. Therefore, such approach gives rise to mental resistance and the desire to strengthen traditional and common methods and practices in the learning process, to convince that traditional components of the educational process are relevant. Thus, technological innovations shall be regarded together with managerial innovations performed systematically and it is necessary to develop psychological adaptation platforms aimed at revealing the innovative thinking among key developers of the educational product.

Theories of innovative development, in particular the diffuse orientation of innovations, have become widespread in European and American research practice [14]. The American sociologist Everett Rogers studied how, why, and at what frequency new ideas and technologies disseminate across different cultures; defined "diffusion" as a process, which implements the innovation through specific channels among members of social systems [15]. When analyzing various social groups in the context of taking innovative decisions, according to E. Rogers, there are:

- 2.5% of the individuals that adopt an innovation - the innovators;
- about 13.5% - early adopters;
- 34% accept innovations at an early stage of their implementation (early majority);
- The next 34% belong to the "late majority";
- 16% are conservatives who accept innovations with a delay, "laggards".

Rogers highlighted the factors specifying the essence of innovative solutions [15], particularly freedom, voluntary involvement and being guided. The decisions taken directly influence the process as regards the implementation of innovations and define their future efficiency. Due to these factors, 3 types of innovative decisions have been defined:

1. A voluntary innovative decision is taken personally by the participant of the innovative process and is not to be obligatorily fulfilled.
2. A collective innovative decision is taken by all participants of the social system based on consensus.
3. A managerial innovative decision is taken by a group of persons who have impact on social systems and management leverages.

Innovations in educational processes have a systematic character and require an agreed cooperation between all participants of the innovative movement.

### **3 Methods**

#### **3.1 Research design**

The research uses the methodology of the survey “Semantic Differential” developed by a group of American psychologists led by Charles Osgood [16], which allows revealing the audience’s attitude to innovative changes in professional activity. Based on the chosen methodology, the authors study cognitive components of subjective perception by university teachers and students of innovative transformation processes in the educational microenvironment.

The authors assume that it is possible to distinguish rather invariable components of perception and the audience’s attitude to innovations (perceptive and cognitive vision of the innovation process). The latter reflect the emotional and cognitive assessment of personal capabilities and general mental attitudes of the recipients and developers of the educational product. The study of the latter allows detecting the degree of collective readiness for changes and the presence of impediments to innovative development.

In the framework of the hypothesis, a range of possible associations was selected. They arise as a result of estimating the perspective of implementing LMS Moodle digital platform and transformation of the traditional educational process. Teachers and students were offered to assess personal capabilities, perspectives and attitudes concerning the innovative policy implementation in higher educational institutions by factors.

The following main perception factors are distinguished:

- Emotional feelings and attitudes towards professional changes;
- Positive expectations from innovative challenges;
- Personal involvement in the innovation process;
- Motivation for development and self-improvement;
- Comprehensive understanding of the innovation process.



### 3.2 Sampling

Sampling for test's performance: academic staff (N = 95) (Table 1) and students (N = 300) (Table 2) of the Russian State Vocational and Pedagogical University and Beihang University, Beijing, China. Assessment factors are presented in Fig. 5.

**Table 1.** Sampling for test's performance – academic staff

Sampling for test's performance	Higher educational institution	Quantity	Age	Gender	Scope
Academic staff	Russian State Vocational and Pedagogical University	43	35-60	M-16 F-27	1. Psychology of education and professional development 2. Engineering and professional training in vehicle manufacturing and steel industry 3. Professional pedagogy and psychology 4. Sociology and social work 5. Economics, management and marketing 6. Professional and economic education 7. Theory and methodology of physical culture 8. Documents' flow, history and legal support 9. Information systems and technologies
	Beihang University, Beijing, China	52	35-60	M-23 F-29	1. Educational economy and management 2. Humanities and social sciences 3. Economy and management 4. Information management and information systems 5. Economy and finance 6. Business management (accounting, logistics)

**Table 2.** Sampling for test’s performance – students

Sampling for test’s performance	Higher educational institution	Quantity	Age	Gender	Year	Specialty
<b>Students</b>	Russian State Vocational and Pedagogical University	173	21-30	M-79 F-94	1-2	1. Psychology of professional education 2. Information systems and technologies in media industry 3. Digital economy 4. Economy and management 5. Vehicle manufacturing and material processing 6. Documents’ flow management within digital economy 7. Power industry 8. Education in the field of a foreign language 9. Recreational and sports activity
	Beihang University, Beihang, China	127	23-31		1-3	1. Administration Management 2. Educational Economy and Management 3. Business Administration 4. Information Management and Information Systems 5. International Economics and Trade 6. Project Management

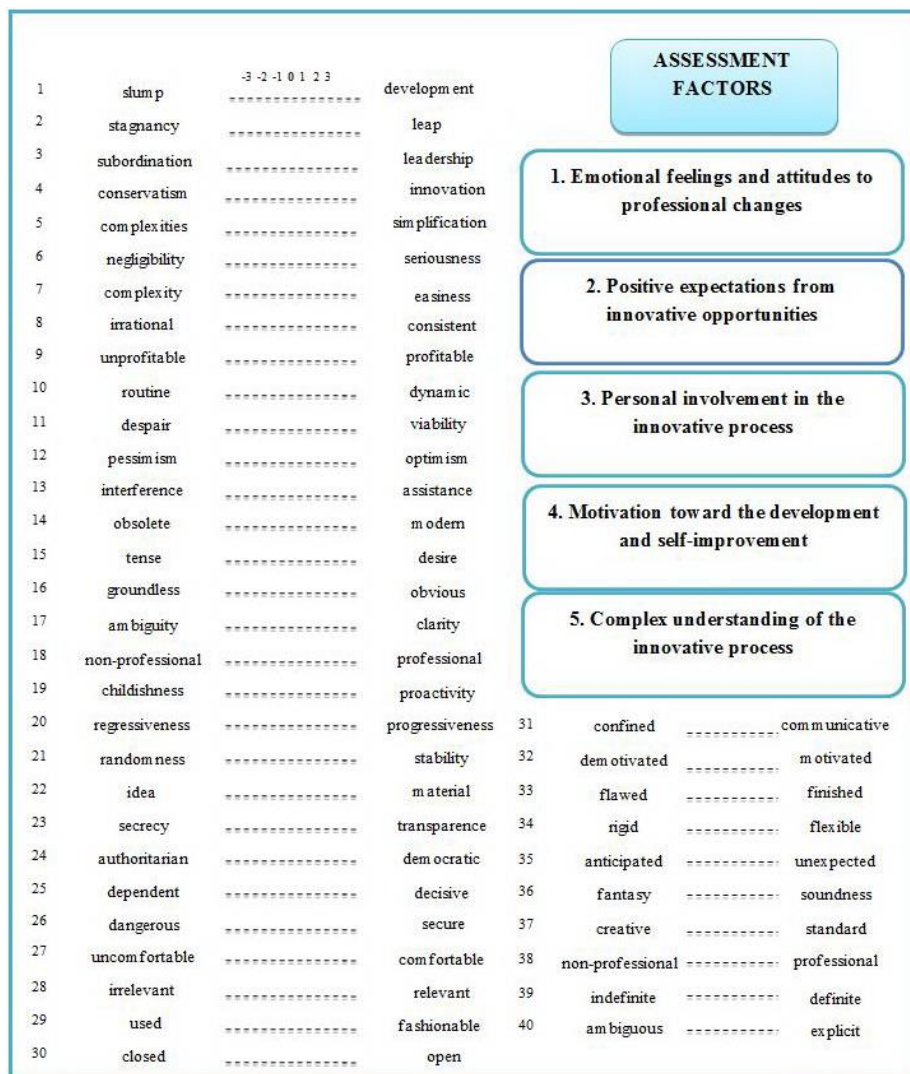


Fig. 5. Assessment factors

Factor-based structure of assessment of personal capabilities because of LMS Moodle implementation in the educational process of the Russian State Vocational and Pedagogical University and Beihang University is presented in Table 3.

**Table 3.** Factor-based structure of assessment of personal capabilities because of LMS Moodle implementation in the educational process

No	Factors	Assessment				
		1	2	3	4	5
1	Development / slump			0.689		
2	Leap / stagnancy		0.738			
3	Leadership / subordination				0.718	
4	Innovation / conservatism				0.462	
5	Simplification / complexities					0.599
6	Seriousness / negligibility	0.620				
7	Easiness / complexity					0.592
8	Consistency / irrationality	0.485				0.546
9	Profitability / loss		0.540			
10	Flexible / routine					0.507
11	Viability / despair				0.766	
12	Optimism / pessimism	0.618				
13	Assistance / interference			0.645		
14	Modern / obsolete		0.824			
15	Desire / tense	0.637				
16	Obvious / groundless					0.675
17	Clarity / ambiguity					0.636
18	Professional / non-professional		0.593			
19	Proactivity / childishness			0.759		
20	Progressiveness / regressiveness		0.515			
21	Stability / randomness					0.776
22	Material / idea	0.495				
23	Transparency / secrecy		0.627			
24	Democratic / authoritarian			0.491	0.563	
25	Decisive / dependent			0.710		
26	Secure / dangerous					0.700
27	Comfortable / uncomfortable				0.559	
28	Relevant / irrelevant	0.843				
29	Fashionable / used		0.524	0.611		
30	Open / closed					0.685
31	Communicative / confined					0.642
32	Motivated / demotivated	0.750				
33	Finished / flawed					0.645
34	Flexible / rigid		0.519	0.575		
35	Anticipated / unexpected					0.508
36	Soundness / fantasy					
37	Standard / creative					0.550
38	Professional / non-professional					0.551
39	Explicit / ambiguous					0.481
40	Definite / indefinite					0.631
	Influence of the factor	4.448	4.88	4.48	3.068	8.622

### 3.3 Research restrictions

The research methodology is mainly restricted by the fact that only respondents' attitude to innovation process is evaluated, which enables to understand the general trend of collective opinion and the respondents' mental readiness for its implementation. Cultural differences in the professional development have not been considered in the research. The mental readiness of the respondents at Beihang University to incorporate LMS Moodle into the educational process was higher than that of the respondents of the Russian State Vocational and Pedagogical University. In addition, the research has not covered teachers' professional readiness towards the formation of the educational product based on LMS Moodle as well as students' technical capabilities to carry out training using ICTs. However, the analysis of the latter is important for making decisions on the implementation of innovations. Therefore, the research reflects only the initial model of collective perception, which changes under the influence of administrative policy, infrastructure opportunities and time boundaries. The research should be conducted at each stage of the innovation implementation, as a managerial methodology for the diagnosis of collective opinion.

## 4 Results and Discussion

Due to theoretical model, which is the basis of the methodology, perception factors can be regarded as key content triggers that as a whole lead to a subjective assessment of innovation process, mental representation, relation towards an innovation shift in an ordinary working environment within collective measurement (Fig. 6).

General perceptive and cognitive relation towards the innovation process by students	
Emotional feeling and attitudes to professional changes	Seriousness, optimism, desire, reality, relevance, motivation, reasonability
Positive expectation from innovative opportunities	Leap, profitability, actualization, professionalism, progressiveness, transparency, modernity, flexibility
Personal involvement into the innovative process	Development, assistance, proactivity, democracy, powerfulness, flexibility, modernity
Motivation to development and self-improvement	Leadership, innovation, viability, comfort, democracy
Comprehensive understanding of the innovative process	Simplification, easiness, reasonability, development, obvious, clarity, stability, security, openness, communication, excellence, soundness, standardization, professionalism, clarity, unambiguous, predictability

Fig. 6. General perceptive and cognitive relation towards the innovation process by students of the Russian State Vocational and Pedagogical University and Beihang University

**Factor 1** (4.448%) reflected the emotional attitude of students to changes in the educational process, which was associated with seriousness, optimism, desire, reality, relevance, motivation, and reasonability.

**Factor 2** (4.88%) reviewed such prospects for participants of the innovation process as leap, profitability, modernity, leverage, progressiveness, transparency, modernity, flexibility.

**Factor 3** (4.48%) showed the audience attitude to participating in the innovation policy of higher educational institution and was associated with development, assistance, initiative, democracy, leverage, flexibility, modernity.

**Factor 4** (3.068%) displayed the motivation triggers for development and self-improvement among the survey respondents associated with leadership, innovation, prospects, comfort, and democracy.

**Factor 5** (8.622%) demonstrated a high level of understanding of the innovation policy and the need to introduce advanced technologies in the educational process.

Survey participants associated LMS Moodle educational platform with simplification, easiness, common sense, development, obviousness, understanding, stability, security, openness, communication, excellence, thoroughness, standard, skill, clarity, unambiguity, predictability. This indicates the readiness of participants to innovative shifts in technological processes.

The perceptive and cognitive attitude of students and university teachers to the innovation process has been researched. The research indicates that the subjective assessment model of the innovation process with clear meaningful perception factors allows understanding the collective attitude to university's policy and identify the mental attitudes necessary for working with the human resources in the process of social adaptation and diffusion of innovation. In order to ensure a comprehensive and efficient approach in the launch of the educational product based on LMS Moodle platform, the need for a synergy of technological and managerial innovations is becoming viable.

The modern model of the educational process focuses on a high standard of educational quality; that is why, many state and commercial educational institutions use LMS Moodle, which is convenient in the application and is a kind of standard for a distance and blended learning [6]. This platform can be used to organize the traditional, distance, blended, and adaptive learning using elements of artificial intelligence [17]. Using LMS Moodle system will inevitably become a means of improving the quality of distance learning and the education in overall [2].

Advanced researches on the use of LMS Moodle's technological capabilities in the educational process of the higher educational institution have proved that the LMS Moodle distance learning system develops students' thinking and innovation [18]. LMS Moodle as well provides an effective learning process through the established methodology for developing innovative solutions by students and their implementation (inspiration, idea, invention, realization). The LMS Moodle system encourages students to complete projects, develop and disseminate new knowledge with team members using online applications [17]. Due to the concept of open source software, the Moodle system is becoming more widespread in the global information

educational space and is used not only by universities and schools, but also by private companies for professional training of employees [19, 20].

The study of motivating and demotivating factors affecting the convenience in learning pointed out that the access to mobile phones and laptops, receiving the feedback from the teacher through Moodle, and the presence of developed materials in an online format provide convenience and easiness for students. However, technical issues, established deadlines, errors in texts and erroneous automatic evaluation are demotivating factors. In teachers' opinion, the opportunity to post news and additional training materials, set individual tasks, organize joint training via Internet and have statistics for monitoring students' behavior in the Moodle motivate to use the latter. By the way, an additional loading, technical issues, plagiarism in students' works and difficulties in finding out the actual user upon knowledge assessment are demotivating factors [19].

The authors agree with research results of LMS Moodle efficiency in ensuring the comfort and convenience of the learning process [2,6,12,18,19]. However, to form comprehensive vocational education of the future specialist, various pedagogical methodologies and technologies, as well as modern learning platform are necessary. Therefore, the authors have actualized the need for synergistic interaction of technological and managerial resources at the stage of transfer of professional skills from developer to recipient of vocational education. The latter would include four phases of interaction: socialization, externalization, combination and internalization, which will make vocational education convenient for class audience. In the authors' opinion, this approach to the formation of a professional educational resource is able to ensure the high competitiveness of the university in the educational space, since a well-trained specialist is the face of the university.

To ensure the successful implementation of the LMS Moodle system in the educational process, it is necessary to create the appropriate infrastructure for e-learning and software adaptation [3,5], train teachers and develop appropriate curricula. The research was carried out to assess the attitude of participants towards university's innovation learning policy. The research has actualized the necessity to search for managerial innovations that through influencing the human factor will be able to provide the maximum effect from innovation policy's implementation.

## **5 Conclusion**

The article considered the opportunities of using LMS Moodle tools to ensure the effective implementation of an innovative policy of the higher educational institution. In the framework of digital transformation of social space for higher educational institutions, an important and relevant topic is the creation of high-quality information and communication environment. The latter should correspond to the contemporary state of science and technology development, global educational standards and needs of information society.

LMS Moodle implementation in the educational process provides a competitive advantage for the university in the educational space. LMS Moodle extends

information and educational space and implements the principle of continuous learning, increases students' population (due to distance learning). Such a platform also forms qualitative and comprehensive educational product, extends international relations, allows for cost optimization and rational use of the university infrastructure.

The authors investigated the advantages of the Moodle system in ensuring a full-fledged educational process through the extensive educational content, a system for control, monitoring and evaluating the knowledge quality. For elaboration of comprehensive vocational education of the future specialist, various pedagogical methodologies and technologies and modern educational platform are considered viable. Thus, the synergistic interaction of technological and managerial resource in the process of transfer of professional skills from developer to recipient of vocational education was updated. Four phases of interaction were established: socialization, externalization, combination and internalization. This will make vocational education convenient for the class audience.

The conducted research of university students' and teachers' perceptive and cognitive attitude to the innovation process has brought out the subjective assessment model of the innovation process with clear meaningful perception factors. Such a model enables to understand the collective attitude to the policy of the higher educational institution and defines the mental attitudes necessary for working with the human resources within the social adaptation and diffusion of innovation.

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Article submitted 2020-04-17. Resubmitted 2020-05-23. Final acceptance 2020-05-25. Final version published as submitted by the authors.