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TECHNOLOGIES OF IMPROVING THE UNIVERSITY EFFICIENCY BY USING ARTIFICIAL INTELLIGENCE: MOTIVATIONAL ASPECT

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Abstract. The aim of this study was to identify the most appropriate technologies to improve the university efficiency by using the motivational artificial intelligence (AI). Methods of the study were as follows: the questionnaire survey by using the Google Chrome electronic service, content analysis, methods of statistical analysis, and a focus group. The authors' version of the questionnaire was made by using the Likert methodology taking into account indicators of the QS World University Rankings rating system. The data obtained during the three stages were generalized and analyzed by using the descriptive statistics. The regression analysis was used to study the relationship between the motives of the academic staff (AS) and the nature of the stimulating effect of the university authorities on the staff of the university. Results: The discrepancy between the AS motivation structure and the range of stimulation methods applied by the university authorities, a continuous increase in the burden from introduced innovations, and the formal style for employees to fulfill new tasks have been revealed. The analysis of the results on using the techniques and methods by the university authorities to motivate and stimulate the staff has shown the need in new combinatorics, an innovative system that harmoniously combines the advantages of natural and artificial intelligence to motivate the AS in training HR for the digital economy of the 21st century. The new system should be universal and flexibly respond to constant changes in the socio-economic environment. It is important to timely eliminate the contradictions in needs and teachers' opinion on the ideal assessment system of their activities and offered forms of stimulation by universities authorities. The vectors of their activities must be constantly coordinated, based on the AI capabilities. The introduction of AI in the activities of universities improves the competitiveness of promising, innovative teachers and has positive impact on the image, efficiency, academic reputation, and citation index of universities. The authors for the first time ever have studied the problems of using the AI in the motivational system of the university's AS and offered technologies to improve the efficiency of universities by using the motivational AI. The practical importance of solving the problem is related to the real possibility of applying the offered technologies by the university authorities that strive to improve their efficiency and competitiveness in the educational market. The main advantage of the work is related to the advanced solutions of the emerging problems on using the AI in motivating the university staff identified during the three-stage study. The interdisciplinary nature of the study and the offered technologies can serve as the basis for the further study and an additional element that expands the views, approaches, and the framework of categories and concepts of the world science. Conclusion: The most suitable technologies for the university that strives to be efficient include the elimination of the imbalance in the system of staff motives – incentives of the university (employer) authorities, the harmonious use of the AI in educational activities and the system of motivation and stimulation of staff where the natural intelligence prevails, and the improvement of the staff's publication and grant activities by using the AI with a synergistic effect due to efficient team building.

Keywords: technologies; motivation and stimulation; artificial intelligence; efficiency; higher education

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JEL Classification: O31, O34

1. Introduction

In the modern world, the competitiveness of organizations is determined by their opportunities and abilities to constantly create innovative products and introduce them into various areas of the human life. The competitive advantage of companies is achieved through highly qualified HR, their creative and innovative potential, advanced management, and competent personnel and investment policy. Efficiency and competitiveness are strived for in all areas of the economy. There is as intense competition in training and higher education. The best universities are defined according to certain methods by using rating systems. The rating of a university, its importance, value, performance, and efficiency are determined by specified indicators. Indicators may differ depending on a rating system (Girdzijauskaitė et al., 2019). In this article the leading QS World University Rankings rating system was taken as a basis. Its main indicators with weighted values are academic reputation (40 %), reputation among employers (10 %), ratio of teachers to students (20 %), citation index (20 %), share of foreign students (5 %), and share of foreign teachers (5 %).

The Russian system of education is being reformed. It had been decided to bring it into compliance with the requirements and terms of the world community's efficiency. The main work started in 2013 – 2014, when Russian universities were assessed for efficiency. Some universities were defined as inefficient, and they were disbanded. Other universities were rated as partially inefficient, and they were given an opportunity to become efficient. However, the overall picture was not good. According to QS World University Rankings, in 2014 – 2015 even leading universities of the country were not included in the list of the 100 best universities in the world. The Lomonosov Moscow State University took position 114. American and English universities were leaders of the ranking. It was necessary to take urgent measures to correct the situation, taking into account the enormous potential of the Russian higher education. It was important to reform all systems, including the most important of them – the staff motivation and stimulation system.

Rather many university principals started acting by using the following principle: “You need to fight for a good student. I can buy any professor (teacher)”. They chose the material, monetary motivation out of the basic motivation forms. This was controversial. On the one hand, the AS wanted to improve their financial situation and began to work according to the rules offered by the university authorities. On the other hand, in universities there was a certain type of people with a wider range of needs expressed in the motives of recognition, respect, development, and confidence in the future. The created system of motivation and stimulation did not work fully and ignored the most important motives of the university teacher's work. At the same time, strategic goals required to include teachers' initiative, creativity, innovation and team spirit in training the HR under new conditions of the digital economy. The lack of appropriate incentives did not destroy these motives among teachers, but it did not motivate to more active actions in this direction. All this considerably reduced the efficiency of universities. The AI had great potential, covered more and more areas of the human life, and gradually spread its effect to the higher education. However, its role in the systems of motivating the university staff was close to zero. The current situation required to search for technologies to improve the efficiency of universities by using the AI. One of the ways to solve this problem was to improve the motivation of the AS based on the AI. It could really improve the academic reputation and citation index of universities that jointly made up 40 % of the rating value.

2. Literature review

Theoreticians and practitioners have always been interested in issues on improving the efficiency of organizations. This is especially relevant in the context of the economy stagnation or economic crisis, and the need to fight against shadow income (Kaurova et al., 2013). Nowadays, more and more solutions to improve the

efficiency of organizations are sought in the area of personnel management (Buley et al., 2016), as well as skillful implementation of the AI in business processes related to the competent use of the human potential (Ossmy et al., 2019; Pomato, 2019; TextRecruit, 2019; Unilever, 2019). Various technologies based on using the AI in the HR are offered (Zimenkova et al., 2018). The issues on the AI impact on the labor market, reduction of labor force (Shi, 2019), increased competition among employees of organizations, and revealing of their best and worst qualities (Burrell, 2019) are considered.

Studies are carried out in relation to the problems of the interaction between the natural and artificial intelligence (Belciug & Gorunescu, 2019; Kumar & Kumar, 2019; Das et al., 2019). The AI impact on the human psyche and behavior is studied (Abubakar et al, 2019; Kalmady et al, 2019).

The AI is being actively introduced to the educational process. In Spain, teachers create virtual environments based on the virtual reality to improve students' motivation to better understand complex topics in real time (Vergara et al, 2019).

In the UK, the issues on forming efficient teams that have the necessary motivation, trust and belonging for the competent use of AI (robots) to study and conduct surgical operations (Randell et al, 2019) are focused on. The motivation of employees to work efficiently more and more dominates in solving problems related to the improvement of the competitiveness of organizations in the public sector and business (Liu & Perry, 2016; Belle & Cantarelli, 2015). The relationships between motivation and stimulation are revealed (Astakhova et al., 2019; Karácsony et al, 2018; Avanesova et al, 2016; Bernardi, 2019).

Algorithms for a complex integrated development of the personnel motivation system under the impact of such factors as cultural, social, personal and psychological are worked out. It is offered to classify motivation into motives of three levels: national, regional and personal (Predeus et al., 2019).

In this case, sometimes controversial motivational models are created. They are based on a temporary delay in paying the fair compensation. They are based on the logic of a long-term improvement in professional competence, career growth depending on the work experience (Fujimura, 2019). As a whole, this contradicts the principle of timely deserved certain reward, rather than indirect, time lagging, unclear prospects. The lack of results from investments may affect the staff motivation (Veretekhina et al, 2018; Belousova et al, 2016).

Motivation is important in the system of managing educational organizations (Vinichenko et al, 2018). Attempts are being made to create innovative models to assess the role of organizational culture, the organizational climate in the exchange of knowledge in the academic environment, in higher education, and the impact of the management style on the trust of teachers in the area of knowledge (Al-Kurdi et al., 2019). The issues related to the impact of leaders of the academic environment, advanced scientists on the correct exchange of knowledge, the promotion of advanced technologies, and interaction among scientists at different levels are brought up.

The creation of models for the professional development and management based on the efficient motivation of university teachers is studied. Based on the comparative analysis of training and organizing classes for the AS, Dunbar D. (2019) offers ways to optimize the motivation of sportsmen and business representatives. The gamification of educational activities is actively being introduced into the motivational system (Shakhovska, et al, 2019; Marti-Parreno et al., 2016; Lumsden et al, 2016).

The reasons for the decline in the quality of education in higher education are identified. The decline in working conditions is the most important one. In Nigeria, these include low teacher motivation, poor funding, and lack of training and equipment for classrooms (Laseinde et al, 2019). In a number of other countries, they include a high academic load, poor transport accessibility, management style of authorities, problems on introducing the AI into

training and practice (Rogach et al, 2016; Koch & Brockmann, 2019). Issues on the priorities in the AS work: what is more important for the professor: to improve personal publication activity or teaching, HR training? – are set (Ouardighi et al., 2013; Prichina et al., 2017).

Teachers carry out the work to motivate students to consciously choose training courses in accordance with the cost-benefit system (Scott et al., 2019). Researchers at the Southern Illinois University Edwardsville School of Pharmacy determined a dependence of the motivation of pedagogical graduates and teachers on the experience of the university AS, and their self-assessment of competencies (Poirier et al, 2019). This is relevant for the Russian teachers, whose status considerably declined during the educational reform (Ilina et al, 2018). The most suitable ways to use social networks are actively being searched for to exchange knowledge of a different nature and content, and to systematize the studies (Ahmed, et al 2019). The improvement of trainees' motivation was also determined among service personnel of universities in the UK during advanced training (Coomber, 2019).

Thus, the issues on motivating the AS of universities attract the attention of many researchers. Recently, more and more works have been devoted to using the AI, and applying it to improve the motivation of the AS. However, no integral work has been created to describe the mechanisms for improving the efficiency of the AS by using the motivation-based AI. The high need in defining technologies to improve the efficiency of universities by using the motivational AI and the lack of scientific works on this theme has become the basis for writing this article.

3. Methods

The aim of this study was to identify the most appropriate technologies to improve the university efficiency by using the motivational AI. Due to this, the following **scientific problems** were solved:

1. To define the technology for eliminating the imbalance in the system of staff motives-incentives of the university authorities (employer).
2. To develop the most appropriate technology (methods) of applying the AI in educational activities and the HR motivation and stimulation system.
3. To identify the technology to improve the publication and grant activities of the staff.

Methods. The study was carried out by using a set of sociological methods that included a questionnaire survey, content analysis, statistical analysis methods, etc. The survey was carried out online by using the *Google Chrome* electronic service, email and online contacts with respondents. The authors' version of the questionnaire included 19 points at the second stage, 23 points at the third stage, and was formed by using the Likert methodology taking into account indicators of the *QS World University Rankings* rating system. The obtained empirical data, secondary data of other authors' statistical studies were studied, generalized and analyzed.

The focus group included foreign experts who specialized in improving the efficiency of organizations and motivation.

The study included **three stages**: **Stage I** – the formation of a new system of motivation and stimulation in the context of the university reform, **Stage II** – the identification of weak elements, additional system resources, and **Phase III** – the optimization of the created system based on the comparative analysis of the data obtained during the survey of the AS from Russian universities.

Stage I. The Russian State Social University (the RSSU) was chosen as an experimental site. After another inspection carried out by the Ministry of Education and Science it happened to be on the verge of being

recognized as an inefficient university and disbanded. The new rector formed a special working group to make the university efficient. The expert reforming group included crisis management specialists, as well as the expert group where foreigners participated, whose task was to assess the implemented reforms based on this study.

The primary task of the working group was to develop a concept and program for increasing the values of performance indicators and achieving top positions in the rating of universities. The work on improving the efficiency of the university was organized in three areas: bringing into compliance (optimization) the system *staff motives – incentives of the university authorities (employer)*; searching for an appropriate technology, ways to use the AI in educational activities and the system of motivation and stimulation of staff; and identification of ways to improve the publication and grant activities of the staff.

At **Stage I**, the **main methods** included the comparative analysis, the content analysis of the current legal documentation, and the method of mathematical statistics.

At **Stage II**, weak elements and additional resources of the system were identified on the basis of the sociological survey where 237 respondents had taken part. The total number of respondents was 748 people, and the sample number was 237 people, where there was a 4.5 % sampling error, and the confidence level of 95 %.

At **Stage III**, the created system was optimized on the basis of the results obtained from the sociological survey. The study group included representatives of 23 Russian universities (n = 456). The total number was 245,100 people, and the sample number was 456 people, where there was a 4.75 % sampling error, and the confidence level of 95 %. Using quota sampling, representatives of universities were selected. The quota features included gender, age, academic degree, and academic rank.

The division by gender showed the majority of men – 64 %, the share of women turned out to be 36 %. The age division was in favor of the older age groups (41 – 50 years old and 51 – 60 years old) – 32 % each. There was a relatively fewer number of respondents aged 31 – 40 years old (18 %) and 20 – 30 years (14 %), over 60 years old – 4 %. The shares of the respondents who took part in the survey were the following: 15 % – doctors of sciences, 70 % – candidates of sciences, 15 % – persons without a degree, 6 % – professors, 67 % – associate professors, and 27 % – respondents without any academic title.

4. Results

3.1. Technology for bringing into compliance, eliminating imbalances in the *teacher's motive – university's incentive system*

At **Stage I** in the course of grading the university and introducing a new system of motivation and stimulation, the most acceptable forms were searched for. The **technology** was used to bring into compliance, eliminate imbalances in the *teacher's motive – incentive of the university authorities* system.

The grading technology used as the initial step at **Stage I** gave a positive effect. The organizational and staffing structure was optimized, and the number of administrative staff was considerably reduced (Kirillov et al, 2015). Taking into account the limited number of reform supporters seeking to improve the university efficiency, and the grading time, counter-reforms started more and more considerably restraining the development of the university. The expert reforming group started searching for additional resources to improve the staff motivation.

At **Stage II**, a sociological study was conducted at the RSSU to identify the reserves of this system according to the method of V.I. Gerchikov (2005). In accordance with his methodology, there are five types of motivation: instrumental, professional, patriotic, economic, and lumpenized.

The identification of priority motivational profiles of the university staff made it possible to focus the authorities' and the HR department's attention on targeted stimulation of those motives that were basic for the employees. As a result, it was possible to define that the overwhelming majority (87 %) of the AS had a professionally-instrumental motivational profile. The patriotic type of motivation was the third. Reserves in the motivation system that do not require considerable financial costs were identified for this configuration of the motivational profile. The following incentives were recognized as the most effective: congratulations on the employees' birthday on the university website, gratitude, diploma, honorary sign of the university for the semester, year, providing the head of the structural unit with an opportunity to independently allocate a part of the income earned by performing entrepreneurial activities at the RSSU to his/her team, convenient working time, flexible schedule, a bonus that was equivalent to the employee's personal efficiency per semester (or quarter), widespread use of symbols and active promotion of the RSSU brand, and advanced training and retraining. These events improved the job satisfaction and loyalty of most of the AS, including leading world-class scientists.

Based on the study, two systems were introduced: the teacher assessment system – incentive payments for the intensity, high results, and quality of the works performed according to the *Personal Contribution System*, and incentive payments for performance indicators and criteria in the *Efficient Contract System*. The assessment was carried out according to the method of 360 degrees based on the electronic medium. One of the key performance indicators was the academic reputation, employer reputation, and citation index, which were taken from the *QS World University Rankings* assessment methodology.

The system of assessing personal efficiency of employees named *Personal Contribution System* included the assessment of personal efficiency of employees by five indicators, which were also consistent with the indicators of *QS World University Rankings*: personal performance, innovations (optimization) of the working educational process, improvement of professional knowledge, customer focus; and teamwork (Table 1).

Table 1. Employee Assessment Algorithm for *Personal Contribution*

Index	Employee assessment	Employee's comment	Authority assessment	Authority's comment	Final assessment	Agreed assessment	Your comment
Personal performance	XXX		XXX		XXX	To be chosen	
Innovation (optimization) of the educational process	XXX		XXX		XXX	To be chosen	
Improving of professional knowledge	XXX		XXX		XXX	To be chosen	
Customer (client) focus	XXX		XXX		XXX	To be chosen	
Teamwork	XXX		XXX		XXX	To be chosen	

The following incentives were defined as important, although they were not put into effect: preferential loans subject to continuous work at the RSSU for 10 years or more, contest "Best in Profession", a challenge prize for the best structural unit, and state, departmental awards. Favorable working and rest conditions to maintain health and recreate have not been fully created. Innovative teams in promising areas with leading companies and awards, prizes for special achievements (profitable contracts, important events, establishing promising relationships, etc.) have been partially created.

The issue on establishing labor relations between the university and the teacher was of special importance. In order to improve the AS's feeling of confidence in work and in the future for scientific and pedagogical workers, it was offered (however, not implemented) to prolong the labor contract subject to the continuous work at the RSSU for five – three years, seven – four years, ten and more years – five years (in fact, the labor contract is concluded only for a year).

At **Stage III**, the sociological study was carried out to identify common motivational problems that were characteristic of the AS at universities of the country. During the study, it was defined that most of the respondents were satisfied with the system of motivation and stimulation of the university (73 %) (Figure 1).

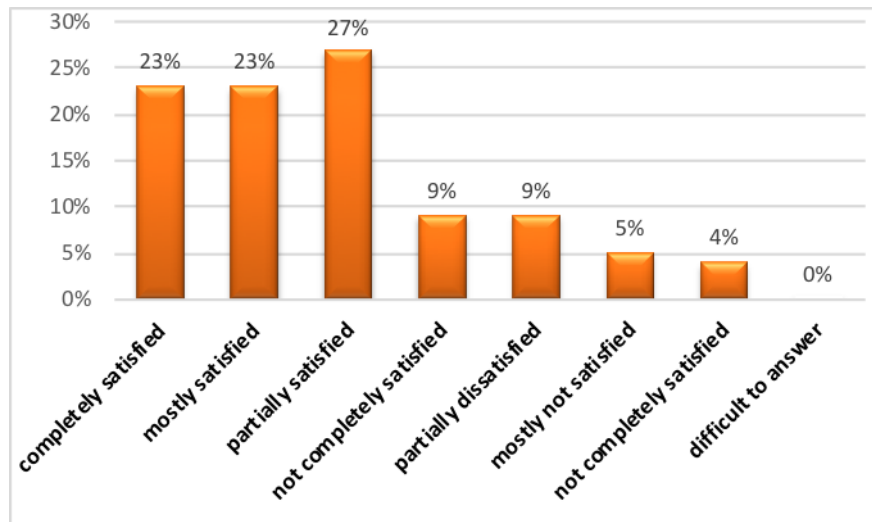


Fig. 1. Satisfaction with the University Motivation and Stimulation System

Moreover, only 23 % of the respondents are fully satisfied with this system. The payment structure is fully suitable for 44 % of the respondents. 50 % of the respondents believe that the payment structure requires further development. These results indicate that the problem of creating the optimal system of motivation and stimulation of the AS is typical for all universities in the country. This has a restraining effect on improving the efficiency and competitiveness of universities, raising their positions in the world ranking of universities.

3.2. Technology of Using the AI in the motivation and stimulation system

At **Stage I** the AI was used in the system of motivation and stimulation through transferring part of the educational functions to the electronic environment. The AS were stimulated to create electronic content on the subjects they taught and to publish them on the university portal in the distance education system. As an incentive, there was a thesis on reducing the number of class hours, using more modern teaching forms, using educational videos, and remote tutor-student communication forms. Such way to improve motivation and stimulate the AS to the efficient work had both positive and negative features. In the context of constant changes, it took many efforts to develop electronic content, and the AS failed to create unique courses in a short time. The expectation that students will more actively use the time allotted for independent study of subjects by using the electronic environment and the AI has not been justified. The psychology of students still substantially depends on the direct impact of teachers and administrators on them. Students strive to minimize their efforts to obtain the desired grade, dishonestly carry out the assigned educational tasks, often use other people's works from the Internet, and show them as their own, and involve other people and consulting companies to carry out educational

tasks for money. There are 5 – 65 % of the conscientious students in various training areas and forms. The least conscientious students take distance courses. A number of students find it difficult to work in the electronic environment. Some of them poorly carry out their tasks, and sometimes attach the material that is not related to the subject at all. Teachers had to make students improve their works, and then check the completed student works again. As a result, this overloaded teachers, and the volume of the academic load increased much as compared to the pre-introduction of e-learning, which reduced the quality of education.

At **Phase II**, another negative aspect was the priority of the AI in admitting students to tests and exams. A special expert program calculated the points scored by a student during the academic semester, and determined whether to allow him/her to take the final control test. In some cases, the AI that intended to help hindered the teachers' work. The developed program did not enable teachers to define the trainees' level of preparation, and willingness to fulfill professional functions. Sometimes students did not get the earned points due to failures of the expert program. There were cases when teachers could not set additional points because they could not access additional services. As a result, overcoming the problems created by the AI, teachers started using the system of "manual control" again.

At **Phase III**, there was a task to define the way how to apply the AI in the educational system to motivate and stimulate the AS. As a result, it was determined that only 14 % of the respondents were fully and mainly satisfied by using the AI in the motivation and stimulation system of the university. It was characteristic that almost half of the teachers (41 %) found it difficult to answer this question (Figure 2). This suggests that the teaching environment has not yet fully realized that the AI is increasingly involved in the training process, and there is still no clear assessment of the nature and efficiency of using the AI in teaching students.

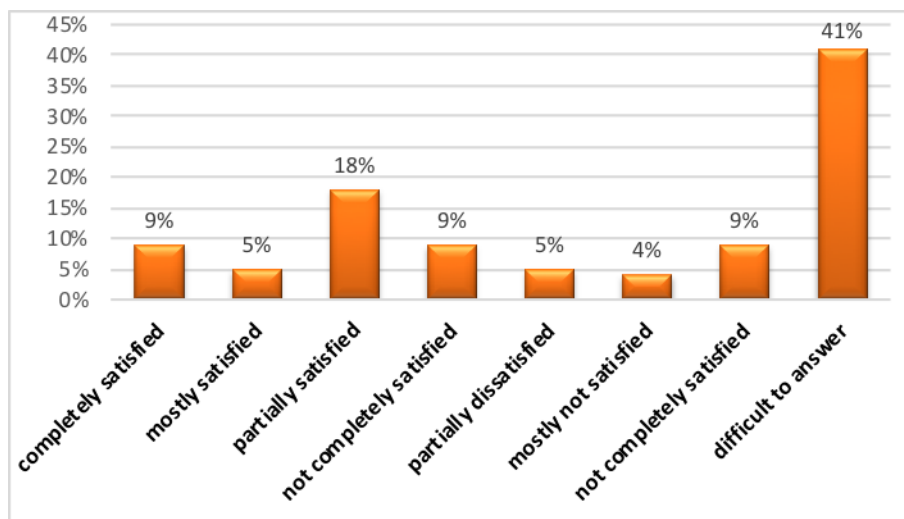


Fig. 2. Satisfaction with the AI Use in the University Motivation and Stimulation System

More than half of the teachers believe that it is possible to create an AI-based system of motivation and stimulation (Figure 3). To a degree, 73 % of the respondents trust it.

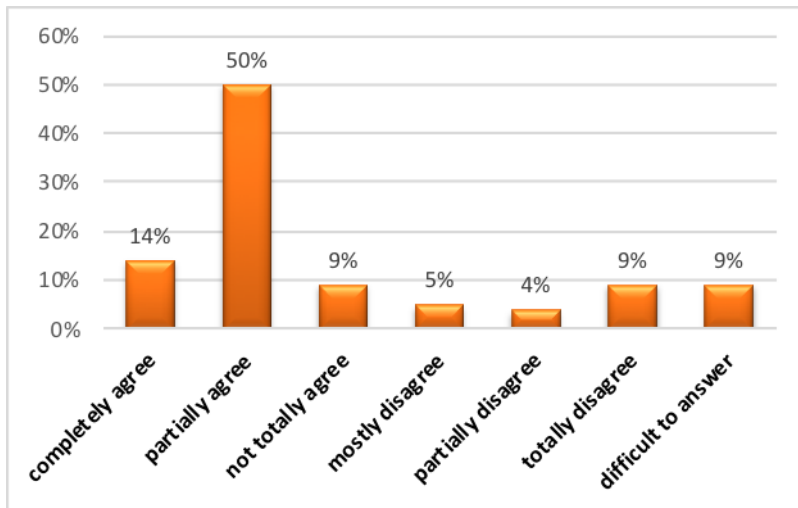


Fig. 3. Possibility to Create the AI-based Motivation and Stimulation System

These results indicate that the AS are not completely satisfied with the assessment of their activities by the university authorities, and would like to entrust the assessment procedure to objective evaluator, the AI-based expert programs. However, it is necessary to take into account that now the AI must still be controlled by people. As experience shows, modern programs are not perfect. In addition to this, there are failures in the electronic environment, which can also cause an opposite (negative) effect from replacing the natural intelligence in assessing the teachers' activities by the AI.

Most of the teachers surveyed believe that AI motivates them to work better (Figure 4).

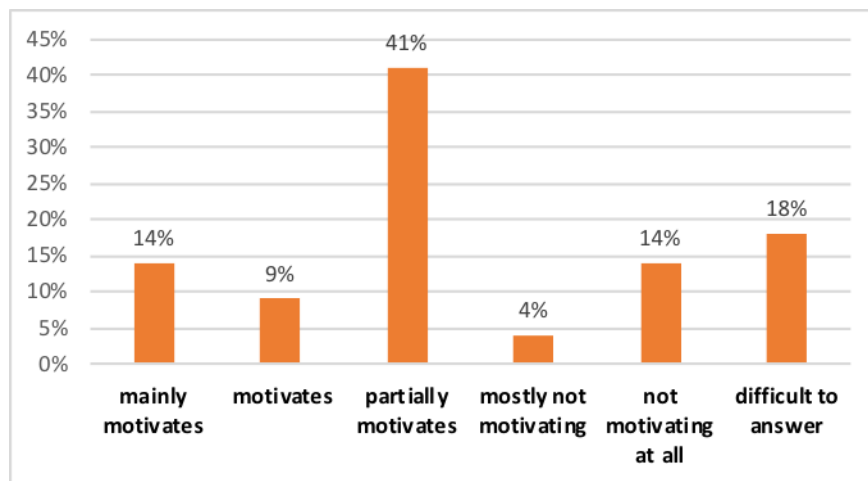


Fig. 4. Answers to the question: "Does the AI Introduced to the Educational Activity Motivate You to Work Better?"

At the same time, it is necessary to note that only 14 % of the respondents are mainly motivated by the AI to work better. It is quite reasonable. This is the number of teachers who stakes in the AI-based training of students. This is related not only to training IT specialists, but other specialties, too. It is positive that rather many teachers are balanced about the implementation of the AI in the educational process. These are the teachers who are partially motivated (41 %) by the introduction of the AI in educational activities.

Moreover, the AI has considerable impact on the AS competitiveness (Figure 5).

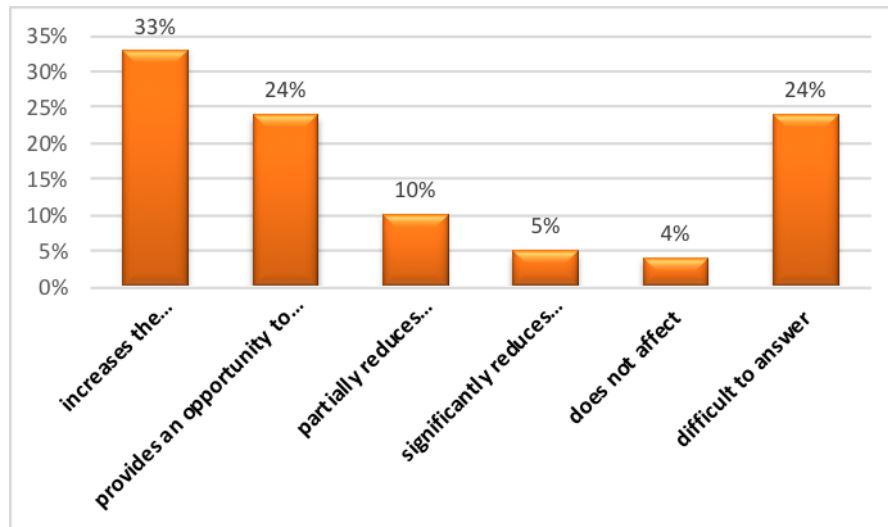


Fig. 5. Answers to the Question: “Does the AI Have Impact on the University Teachers’ Competitiveness?”

Many teachers (33 %) believe that the AI enhances their competitiveness. Twenty-four percent of the respondents expressed the opinion that the AI offered them the opportunity to become better than their colleagues. Five percent of the respondents noted that AI reduced their competitiveness and ten percent said it partially decreased competitiveness. Twenty-four percent found it difficult to answer the question. Thus, more than half of the teachers realized the importance of using the AI in educational activities, improving their competitiveness in the labor market and the educational market.

The data on the priority areas of using the AI at the university are of great interest (Figure 6). The top-priority areas included learning (77 %) and scientific activities (62 %). It was offered to use the AI least of all in educational work (16 %).

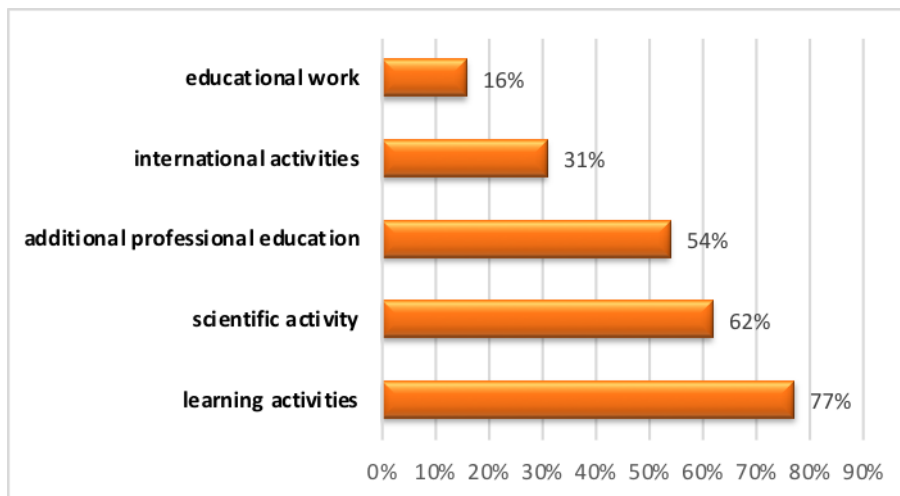


Fig. 6. Answers to the Question: “What Can Be Trusted to the AI to Motivate the University AS?”

These results are controversial. On the one hand, the teacher is the most important element in educational activities. Their main task is not only to provide educational and professional information, but also to bring up a mature member of the society who has an adequate psyche. Here, the most important aspect is the students’

commitment to the corporate culture of the university as a prototype of the future corporate culture of the organization where he/she will continue developing and fulfilling labor functions. On the other hand, the modern generation more and more often obtains information from the electronic environment, social networks, and is increasingly dependent on electronic devices, the AI that is actively involved in all areas of the human life. Now it is necessary to influence young people, students of various ages by using the AI capabilities. However, in this matter it is necessary to maintain harmony and balance of the teacher’s (natural intelligence) and the AI’s impact on students.

3.3. Technology to Improve the AS’ publication and grant activities

At **Stage I** the system of motivation and stimulation of the AS that is flexible and promising in terms of the publication activity and created by the working group made it possible to considerably increase the number of publications made both by individual teachers and the university, as a whole. According to this indicator, the university strengthened its position, became efficient, and rose in national and international ratings. Moreover, it targeted the number of publications rather than their quality. This was logical, because the indicators of the university did not take into account the quality. However, in the future, the growth in the number of publications sharply decreased and stopped, but in general the university remained efficient (Table 2).

Table 2. Number of Teachers According to Levels of Personal Contribution to the Efficiency of the University

Levels of AS contribution to the University KPI	Publication levels	Grant levels	AS for the given indicators		
			2015	2017	2019
1	WoS -3 Q 1	Grant Level 1 (external, for the amount of above RUB 3 mln)	0 %	1 %	1 %
2	WoS -2 Q 2	Grant Level 1 (external, for the amount of above RUB 2 mln)	0 %	2 %	1 – 2 %
3			1 – 2 %	3 %	2 – 3 %
4	WoS Q 4	Grant Level 4 (external, for the amount of less than RUB 1 mln)	2 – 3 %	4 – 5 %	3 – 5 %
5	Q, Higher Attestation Commission	Grant Level 5 (internal, for the amount of RUB 500,000 – 1 mln)	10 – 15 %	20 – 25 %	25 – 30 %
6	Higher Attestation Commission, Russian Science Citation Index	Grant Level 6 (internal, for the amount of less than RUB 500,000)	50 – 70 %	50 – 70 %	50 – 60 %
7	Russian Science Citation Index	-	10 – 15 %	25 – 30 %	25 – 30 %
	With a foreign co-author		5 %	10 – 15 %	10 – 15 %

The division of the AS by the contribution to the university KPI shows that the vast majority of the AS covered the lower level of the university performance indicators. This is natural, because in such a short time it was possible to develop and publish scientific articles only in the bulletins that took low positions of the elite databases rating. It was faster, easier, and cheaper.

The most talented and organized teachers, about 15 % of the total number of the AS, were able to realize their potential in a short time and publish the required number of articles in the bulletins indexed in the *Web of Science and Scopus* databases according to the motivation and stimulation system. Since the leading researchers have hit the ceiling of stimulation according the created system, their activity started declining. This was manifested at **Stage II** of the study when introducing a new system of motivation and stimulation of the staff. This affected the total number of publications in 2018. It decreased by 14 %.

Other teachers published the results of their research under administrative pressure in the bulletins that took low positions of the elite database ratings, and their number did not increase.

At the same time, there was another problem related to improving the quality of publications. The growth of levels one – three was minimal, which made the university authorities and HR Department amend the staff motivation and stimulation system.

First of all, publication surcharges changed. They were directly related to the level of the bulletin indexed in the *Web of Science and Scopus* databases, where a scientific article was published. The leaders by the number of scientific developments were indirectly stimulated by inviting them to elite internal and external grants. Teachers who developed scientific communication with foreign researchers were psychologically encouraged. However, this required additional costs and was prolonged in time.

At **Stage III** of the study, it was possible to define that 46 % of the respondents were completely and mostly satisfied with the working conditions at the university, including the opportunities for developing the publication activity (Figure 7). Fifty percent of the respondents found it necessary to change the working conditions.

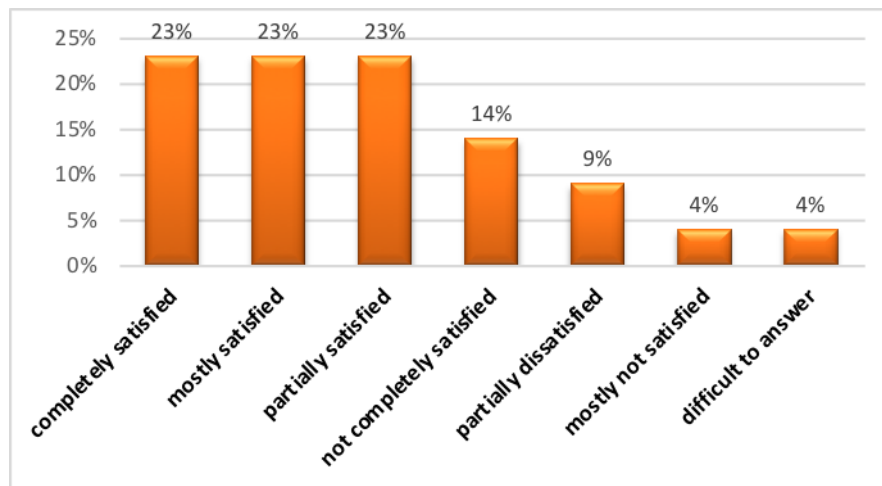


Fig. 7. Answers to the Question: “Are you Satisfied with the Working Conditions at the University?”

Besides, at **Stage III**, the risks associated with insufficiently flexible work with talented employees increased. The university lost 10 – 25 % of the talented employees, leading world-class researchers due to socio-psychological and ethical reasons. A number of employees were not satisfied with the administrative methods of influence, the management style (Figure 8), and some of them were not satisfied with the nature of implementing their ideas. Forty-six percent of the respondents were fully and mostly satisfied with the management style at the university. Fifty percent of the respondents found it necessary to change the management style.

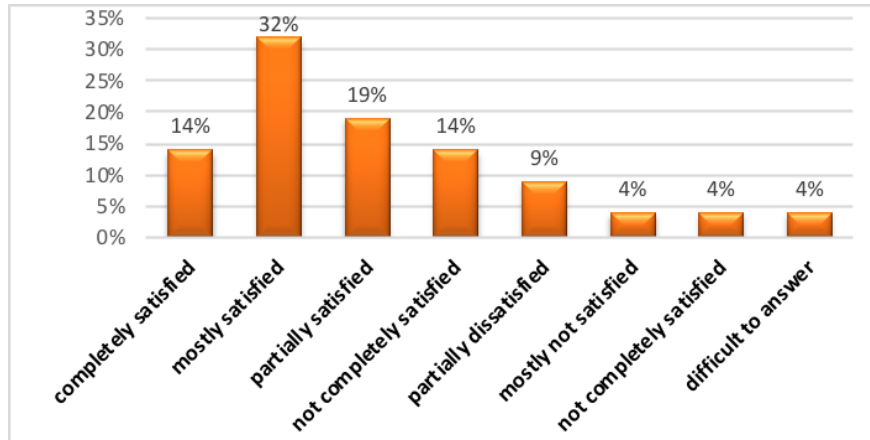


Fig. 8. Answers to the question: “Are you Satisfied with the Management Style of Your Authorities?”

This indicates that the activities of the university authorities are assessed ambiguously. Not only opponents of reforms, but also some supporters are not satisfied with the management style.

The university authorities had to part with some talented employees due to expanding the spectrum and nature of the introduction of innovations that went beyond what was permitted, the slowness of introducing the AI into the educational environment, violation of the conduct rules, including the corruption component.

This forced the authorities to pay more attention to keeping their own and attracting leading world-class researchers from other universities. According to the analysis of the data in Figure 9, only 36 % of the teachers are mostly satisfied and satisfied with the system of additional payments for the scientific activity. Fifty-four percent want to see a better system of additional payments for their scientific activities. A low assessment of the system of additional payments for the scientific activity by teachers creates the prerequisites for the participation of leading world-class researchers in scientific projects outside the university they work at. In its turn, this creates the prerequisites for the further transition of the leading world-class researchers to an establishment that offers more favorable working conditions and better assesses the scientific activity.

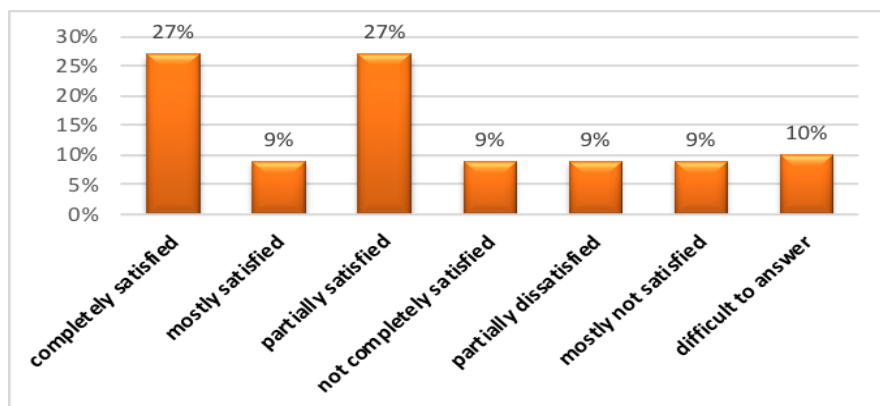


Fig. 9. Answers to the Question: “Are you Satisfied with the System of Additional Payments for Scientific Activity?”

At Phase III, the technology of forming efficient teams was also improved. The talented employees and the AS were consolidated by creating informal teams: scientific, multifunctional, and administrative. Creative, developing employees, primarily teachers, joined their efforts around the researchers who had achieved high indicators and had great scientific and communication potential. The basic motives included the development and

belonging to the team. Scientific teams worked at improving the publication grant activities. Multifunctional teams were formed according to the principle of using each team member's strengths in science, communication, management, and the AI. Administrative teams were formed by employees from the management team who helped one another by using administrative resources and their subordinates.

5. Discussion

The study of the formation and development of a new system of motivation and stimulation in the context of the university reform made it possible to identify the problem areas related to the **compliance of the teacher's motives – university authorities' incentives system** to improve the efficiency of the educational organization. They are similar to such problems in business (Karácsony et al, 2018). In **the focus group**, elements of the motivation and stimulation system used at the Lomonosov Moscow State University – TRUE – were offered as a positive experience. First of all, this was related to the **duration of the contract**. Professional universities have been using one-year **labor contracts** for a long period of time. This is due to the authorities' fear not to accept the required number of students, and to more efficiently influence the AS. At the Lomonosov Moscow State University, the duration of the contract depends on the teacher's rating. If he/she holds a position on the lowest 25 % of the rating, the contract is concluded for one year, while in case of the position in the highest 25 % of the rating, the contract is concluded for five years. The interval between these positions makes it possible to conclude the contract for three years. This improved such teachers' motives as respect, development, confidence in the future, and one incentive – the duration of the employment relationship – applied technologically and fairly. As for military universities, the peculiarity of teachers working there was the conclusion of an unlimited contract with them, regardless of the rating. As the experience shows, when taking a decision, it is reasonable to give priority to the authorities based on the AI capabilities (Belciug & Gorunescu, 2019).

Another issue is related to the fact that **the innovations introduced continuously increase the load** that sometimes exceeds the AS capabilities to fulfill all their functions at a high level and with the required quality. This caused the emasculation of the motive of conscientious, high quality performance of their duties. **The formal style** of teachers performing constantly new tasks that affects the quality of students' training, the image and attractiveness of the university becomes more and more popular. The outflow of students from various courses to other universities increased.

The study showed that the universities authorities could not create a universal motivational system that flexibly responded to constant changes in the socio-economic environment. There are contradictions in the teachers' needs and vision of an ideal assessment system of their activities and the offered forms of incentives by university authorities. The vectors of their activities are not agreed on a number of indicators and contradict one another. This causes the decrease in staff loyalty, especially among leading world-class researchers and talented employees. Sears (2003), Schweyer (2004), Smilansky, 2005, Efron & Orth, 2014, talent management theorists and practitioners, advise on more serious treatment of talented employees. The most important issues are related to keeping talented people in the organization, including cybersecurity issues (International Conference, 2019), improvement of their loyalty in various areas of activity (Chulanova et al 2018).

The study showed that the implementation of the AI in training was a real, objective and irreversible process. However, a lot of AS have not yet realized the importance of its application and form of use. However, in some cases, teachers have more confidence in evaluating their activities by the AI rather than by authorities. This is generally correlated with the search for the efficient leader's behavior (Bryman, 2007).

According to the analysis of the study results, first of all, it is necessary to use the AI in the learning and scientific activities of the university. In fact, it improves the competitiveness of teachers, and most of the AS agree with this, against the opinion about the motivation for a better job. Nevertheless, it must be technologically integrated

into the existing training system without losing the benefits of training specialists by using the natural intelligence, as noted in the study carried out by Zimenkova, Paramonova & Lobacheva (2018). It is necessary to develop **new combinatorics, an innovative system that harmoniously combines the advantages of the natural and artificial intelligence to motivate the AS in training personnel for the digital economy of the 21st century.** It is necessary **to use** the AI in educational activities and the HR motivation and stimulation system **harmoniously subject to the priority of the natural intelligence.** The use of the AI in the educational work is controversial.

The fragmented priority of the AI over the natural intelligence **has been identified.** This creates risks in the real leadership in the AS educational activities. They are accordant with the risks of machine learning (O'Sullivan et al 2019). In addition, the mentality of the student environment is a problem. The AI becomes an assistant for negligent students who strive to get a high mark at the exam rather than knowledge.

The publication and grant activities were improved in an unstable manner: from a sharp increase in the number of publications to subsequent stagnation. This naturally caused the improvement of the motivation and stimulation system with an emphasis on material stimulation. The resources of nonmaterial motivation, especially the ones of the image nature, respect, recognition of merits were not fully used. The achievement of the required quantity of publications in the *Scopus* and *WoS* databases logically caused the solution of the following problem – improving the quality of publications. At the same time, there was a problem of struggling for talented employees, especially leading world-class researchers. One of the promising ways to solve this problem was the technology of forming efficient teams and securing talented employees in them. It is useful to use the AI capabilities to predict the conduct of team members (Abubakar, et al 2019). The desire of the university authorities to improve the efficiency of the university through **the commercialization** of the AS work faced a limited number of teachers with an instrumental type of motivation focused on money rewards. The team technology helped to solve this problem. The team includes commercially targeted teachers who helped the team to directly connect scientific achievements with their implementation and decent money rewards.

Thus, the technology to improve the staff's publication and grant activities by using the AI with a synergistic effect due to the efficient team building **has been formed.**

Conclusions

In the modern world, the terms and conditions for the activity of educational organizations are rapidly changing. In order to maintain high competitiveness, the university management must use advanced management and staff motivation technologies. During the study, in order to achieve the goal and solve scientific problems, the most suitable technologies for the university that strives to become efficient have been identified. These are the following technologies: the elimination of the imbalance in the system of staff motives – incentives of the university (employer) authorities, **the harmonious use of AI** in educational activities and the system of motivation and stimulation of personnel **where the natural intelligence prevails**, and the improvement of the staff's publication and grant activities by using the AI with the synergistic effect due to efficient team building. The analysis of the results on using the staff motivation and stimulation techniques and methods by the university has shown the need in new combinatorics, an innovative system that harmoniously combines the advantages of natural and AI to motivate the AS in training HR for the digital economy of the 21st century. The new system should be universal and flexibly respond to constant changes in the socio-economic environment. It is important to timely eliminate the contradictions in needs and teachers' opinion on the ideal assessment system of their activities and offered forms of stimulation by universities authorities. The vectors of their activities must be constantly coordinated, based on the AI capabilities. The introduction of the AI in the activities of universities improves the competitiveness of promising, innovative teachers and has positive impact on the image, efficiency, academic reputation, and citation index of universities.

The commercialization of the AS activities is improved through efficient team building. The loyalty of leading world-class researchers and the reduction of costs for the system of motivation and stimulation is improved within the prolongation of labor relations with the management of the university. The university authorities, the HR service must take into account possible problem areas when working with talented, key employees. It is important to take into account these risks at the stage of selection, monitoring and improving working conditions, to form and develop a reserve. At the same time, it is necessary to skillfully use the synergetic potential of various teams, developing a system of motivation and stimulation, taking into account the encouragement of the formation and action of teams.

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