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ENGINEERING PERSONNEL WELL-BEING WHEN ADJUSTING TO A NEW TECHNOLOGICAL STRUCTURE: AGE ASPECT

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Abstract

The article gives an analysis of the issues of adoption of innovations in the face of changing technological structure, shows the dew of the importance of emotional regulators of labor behavior. The results of an empirical study of the subjective well-being of three-age engineering personnel at a successful innovative enterprise and an enterprise with long-term problems of transition to an innovative development format are presented. The indicators of subjective well-being included readiness for innovative changes, the self-esteem of fatigue, health conditions, stress experienced in the workplace, psychological well-being in the workforce, and age-related self-esteem. The role of organizational conditions is disclosed as manifested in the enterprise organizational culture as a factor in the subjective well-being of staff. It is shown that, at a problem enterprise, the traditional hierarchical-clan type organizational culture is preserved, which contributes to subjective ill-being in the conditions of innovative changes. The most unfavorable indicators of subjective well-being are characteristic of young staff. In a thriving enterprise with an organizational culture of a market-hierarchical type, engineering personnel, regardless of age, have a high level of subjective well-being as the effects of subjective well-being, the assessment of age by direct managers, commitment to innovative values and personal involvement in the labor process are considered. It is shown that subjective well-being can be considered as an indicator of the socio-psychological age of the staff. The approaches to improving personnel management in the face of changing technological patterns and areas of advanced research are outlined.

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Keywords: Innovation, chronological age, age stereotypes, organizational culture, socio-psychological age, subjective well-being.

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1. Introduction

Under the long-term forecast of the Ministry of Economic Development for the period until 2036, the situation on the Russian labor market will be determined by the transition of the economy to an innovative development path, the introduction of innovations, new technologies, and interaction formats. The ongoing change of technological mode brings with it fundamental changes affecting economic and social systems, fundamentally new content of labor and new forms of management.

At the same time, the Russian economy continues to be characterized by low labor productivity and an aging population, including enterprise personnel (OECD, 2017; RF Ministy, 2010). The ongoing pension reform can partially solve the problem of staff aging. The transition period to the new boundaries of the retirement age will end in 2028. At the same time, the labor force will gradually increase over the entire forecast period from 75.8 million people in 2018 to 79.2 million people in 2036 (RF Ministy, 2010).

However, not only in Russia but also in developed countries, age-related stereotypes live, according to which older workers are not attractive to employers, especially in the high-tech areas of employment. Here is just not a complete list of age-related stereotypes: resistance to organizational change; immunity of the new due to lack of flexibility; decrease in labor motivation and low level of involvement in the labor process; fatigue, often chronic; conservatism, loss of learning ability; unwillingness to take personal responsibility; exposure to stress; disease. Moreover, all of them are in sharp contradiction with the qualities of an employee that are in demand in industry 4.0, the critical technologies of which require new competencies, responsibility for training and self-education, readiness to accept innovations and work in the face of constant organizational changes in the innovation orientation (Carter, Armenakis, Field, & Mossholder, 2013).

At the same time, negative stereotypes of youth already exist and continue to form: weak competence, lack of involvement, a focus on self-development in comfortable working conditions with a flexible schedule in an enterprise with a good brand, inability to long-term attention span, lack of career ambitions, desire to communicate with the boss on peers, many rewards, passivity (Bowman, 2014). Such characteristics also cause many doubts among employers who are not confident in the competence and labor motivation of young employees. Personnel resistance to organizational changes makes the situation in the economy even more dramatic. It is no accident that it is becoming increasingly clear that not the chronological, but the socio-psychological age of an employee has high explanatory power when assessing his professional prospects.

2. Problem Statement

Most of the Russians are not at all determined to continue working at an older age. Particularly acute is the problem of the continuation of labor activity because it will have to continue in the face of a change in technological structure.

In order for a person to have a desire to continue working at older ages, to obtain new professional knowledge and to master new technologies, it is necessary, not coercion, but appropriate emotional

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regulators. The most crucial emotional regulator of work is the subjective well-being (WB) of staff (Brief & Weiss, 2002).

Sociological studies had shown that half (51 %) of Russians surveyed said they had stopped working when they reached retirement age. Among the reasons for which they left their jobs, the most frequently cited are the deterioration of their health, physical, and psychological fatigue, which indicates a clear subjective disadvantage in work. The other part would like to receive a pension, but continue to work to maintain their modest income level, i.e., forcedly, based solely on utilitarian motives, which also cannot be attributed to the manifestation of positive WB.

WB is understood as an emotional assessment of satisfaction with life in general or with its specific areas, including labor activity. A key component of WB concerning work is the desire for progressive technological and organizational changes against the background of positive emotions associated with work (Diener, Oishi, & Lucas, 2003). WB is a complex multilevel phenomenon that includes affective, cognitive, social, professional, and psychosomatic components with complex external and internal determination: from social culture and organizational culture to job satisfaction, emotional exhaustion, and psychosomatic stress (Charalampous, Grant, Tramontano, & Michailidis, 2019; Daniels, 2000). The identification of external determination is especially important in solving management problems, including WB, as an emotional regulator of labor activity. The main external determinants of WB in work are organizational conditions, manifested in organizational culture. Organizational culture is its socio-psychological and organizational context, containing values and their corresponding behaviors. It can serve as a source of job satisfaction and subjective well-being, as well as generate intense organizational stress that destroys the psychological viability of staff in the face of organizational changes, creating a feeling of subjective dysfunction among employees that reduces labor motivation (Bellou, 2010; Everly, Smith, & Lobo, 2013).

The presence in modern Russia of enterprises with an organizational culture of a different type, depending not so much on the specifics of the business as on the level of involvement of the enterprise in innovative processes, makes it possible to identify the nature of the influence of the organizational conditions created by management on the WB of staff of different ages in the context of organizational innovative changes. The introduction of an age-based measurement makes it possible to identify the significance of characteristics related to age-related stereotypes as an explanatory principle for management to make decisions about the professional prospects of employees of various ages in work related to the innovative orientation of organizational changes.

3. Research Questions

1. Does subjective well-being depend on organizational conditions?

2. What are the manifestations of subjective well-being/dysfunction among staff in different types of organizational cultures?

3. Is there a connection between subjective well-being and commitment to innovative values in the context of the transition to a market-innovative paradigm of enterprise development?

4. Is there a connection between subjective well-being and personal involvement in the labor process?

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5. Is it possible to consider subjective well-being as an indicator of the socio-psychological age of an employee?

4. Purpose of the Study

A study is conducted to reveal the characteristics of the subjective well-being of engineers of different ages at enterprises with different involvement in innovative processes.

5. Research Methods

The study was conducted in two stages. At the first stage, the basis of empirical research was determined: two large engineering enterprises, both with a long Soviet history and a total number of employees over 7 thousand people. One of them is innovative, successfully entering into a new technological structure, and the second is experiencing many years of difficulties in modernization and transition to an innovative development format. The state has supported its vitality for many years. The following methods were used: analysis of available corporate documentation (enterprise sites), expert assessment of the economic situation with the involvement of experts from the chamber of commerce, organizational conditions that are manifested in the organizational culture of enterprises identified using the OCAI method of Cameron and Quinn (1999).

In the second stage, the WB engineering corps of these enterprises were studied. As its characteristics, we studied the value readiness for innovative development of the enterprise, the stress experienced at the workplace, fatigue, self-esteem of health, and self-esteem of age.

The value readiness for innovative development of the enterprise was studied using the OCAI method.

Evaluation of age by direct managers, psychological well-being in the workforce, commitment to innovative values, and personal involvement in the work process are considered as effects of subjective well-being.

Personal involvement in the labor process has been studied using the method of personal self-identification. Since it is essential to identify staff motivation to continue working, self-identification has been studied, both at the time of the study and in five years. The ratio of the number of professional-official self-identifications to the number of self-identification in private and family life in the first three positions in the respondents' answers is used as an indicator of personal involvement in the labor process.

Fatigue from organizational conditions, self-assessment of health status, and age state of health were studied using an author's questionnaire, combining questions with the direct scaling method.

The heads of structural divisions, whose staff was included in the respondents, assessed their perceptions of the age of employees using a paired questionnaire.

The nonparametric Mann-Whitney and Wilcoxon criteria, as well as the Spearman rank correlation method, were used as methods of statistical data processing.

Engineers of both enterprises participated in the study as respondents: 130 engineers (men), 260 in total. Each group united three age subgroups in approximately equal proportions: up to 35 years old, between 36 and 59, 60 years and older. From each enterprise, 14 managers acted like experts.

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6. Findings

The data in Table 1 show that an ordinary enterprise has developed a hierarchical clan type of organizational culture with a confident presence of a market component and minimal values of innovation, which is quite typical for enterprises with problems of modernization and transition to an innovative development path.

Table 01. Characteristics of organizational culture and subjective well-being of engineering personnel of ordinary and innovative enterprises

Specifications		Age								
		Under 35			36–59			Over 60		
		Ordinary enterprises	Innovative enterprises	U	Ordinary enterprises	Innovative enterprises	U	Ordinary enterprises	Innovative enterprises	U
Organizational culture	F clan	22.9	17.6	*	28.3	17.4	*	24.1	16.5	*
	P clan	37.8	23.9	*	38.2	18.3	**	35.0	21.8	*
	W	**	*		**	-		*	-	
	F adhocratic	10.4	28.3	**	11.4	27.5	**	13.6	25.6	*
	P adhocratic	12.8	33.2	**	12.4	33.4	**	15.6	30.6	*
	W	-	*		-	T		-	T	
	F market	25.1	35.7	*	19.1	38.8	*	21.2	33.1	*
	P market	21.5	32.1	*	17.6	38.7	**	18.5	34.2	**
	W	-	-		-	-		-	-	
	F-hierarchical	40.6	27.1	*	39.2	25.9	*	38.7	29.2	*
	P-hierarchical	27.9	16.5	*	31.8	14.5	*	30.8	15.7	*
	W	*	*		T	*		T	*	
S / O work fatigue		7.3	6.4	*	7.6	5.7	*	5.0	4.5	-
S / O Organizational Fatigue		8.8	3.1	**	7.2	4.3	*	4.9	3.1	*
W		*	*		-	T		-	*	
Stress		2.6	1.1	*	2.2	1.2	*	1.9	1.3	T
S / O health in general		3.1	3.4	-	1.9	3.7	*	1.0	2.6	*
S / O state of the cardiovascular system		2.4	3.6	*	1.5	3.6	*	0.7	2.1	**
S / O state of the nervous system		1.9	2.9	*	2.6	4.1	*	2.6	3.6	*
Psychological well-being in the work team		-2.3	3.4	**	-2.6	3.7	**	1.5	3.5	*

In table 1: F – the actual presence of value in the organizational culture of the enterprise (in %), P – the level of value preferred by the staff in the organizational culture of the enterprise (in %); S / O– self-assessment of fatigue from work; S / O UO – self-assessment of fatigue from organizational relations; C / O – self-esteem; U – statistical significance of differences by Mann-Whitney criterion; W – statistical significance of differences by Wilcoxon criterion: * -p ≤ 0.05; ** – p ≤ 0.01, T – trend; "-" – there are no statistically significant differences.

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At the same time, age groups nevertheless differ in estimates of the innovative component: the lowest scores are recorded in groups of young men as well as middle-aged men (10.4 and 11.4 %, respectively) and reach a maximum (16 %) among older men. In these same groups, one can see the highest indicators of hierarchical organizational culture. Differences with other groups are statistically significant and reflect some reevaluation of innovation by older employees.

This state of affairs reflects the long-term problems of the enterprise, whose management, due to various circumstances, could not translate it into a market-innovative development format. New management cannot put up with ongoing stagnation; its development policy and concrete actions are aimed at accelerating the introduction of new production technologies. However, these efforts are confronted by the silent resistance of the staff, who kindly recalls the previous leadership. Data on the value preferences of the staff of an ordinary enterprise explain and concretize the current situation. The young part of the staff, even noting a low level of innovativeness, is not inclined to strengthen either the innovative or the market components, but, like the staff of other age groups, wants the uncomplete dominance of the clan component.

Behind these figures is a response to management actions. The implemented management approaches did not cause the staff to move to a market-innovation paradigm. On the contrary, employees are looking for unity, mutual support from each other in this situation. Thus, at the level of value readiness for the adoption of organizational changes, one can see significant potential for reducing subjective well-being in the workplace of a significant part of the employees of an ordinary enterprise.

For an innovative enterprise, the situation is fundamentally different. Although there is some reevaluation of innovation by senior employees, the differences are within the statistical error. The performance of all groups of respondents is statistically significantly higher than that of ordinary employees of an ordinary enterprise. Organizational changes associated with the introduction of new production technologies and improved management have become a common condition for working life. Engineers with significant work experience at the enterprise recall that it was not easy. However, the difficulties of modernization coincided with the general difficulties that the country was experiencing, the efforts of management and personnel were not in vain. Now this story serves as a successful adaptation of new employees who do not always come after colleges and universities, in which they could acquire a willingness to work in a market-innovative environment. Professional and hard work of management gave the result that, regardless of age, the engineering corps assesses the existing organizational culture as a market-hierarchical one with a pronounced innovative component, which is also typical of innovative industrial enterprises.

Moreover, most importantly, employees want to stay in this model, linking the future of the enterprise with it. Moreover, older employees have the most pronounced value priorities of innovative development: strengthening the innovation component from 25.6 % to 30.6 %. There are tendencies to an absolute decrease in the market component and an increase in the clan but within the statistical error limits. All this testifies to the value readiness of employees of an innovative enterprise, regardless of chronological age, to organizational changes.

An essential indicator of subjective well-being is the feeling of tiredness. The data show that in all age groups, the tiredness from organizational conditions among employees of an innovative enterprise is

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statistically significantly lower than in the corresponding groups of an ordinary enterprise. This tendency is especially noticeable with young employees. Their fatigue reaches level 8.8. points out of 10 possible. The prevailing bureaucratic type of management in the context of organizational changes, suggesting a transition to a market-innovation development paradigm, provokes the strongest reaction among young people. It should be noted that for an ordinary enterprise, the level of fatigue from organizational conditions, as a rule, is higher than from the actual labor activity.

This point is not noted at the innovative enterprise: there, the levels of fatigue from organizational conditions and labor activity are close, while among older engineers, it is even statistically significantly lower. At the same time, the fatigue of young employees from labor activity at an innovative enterprise is higher than in other age groups. It is statistically significantly higher than the level of fatigue from labor activity at an ordinary enterprise (6.4 points for an innovative enterprise versus 3.1 points for an ordinary enterprise, $p \leq 0.05$), which indicates that the labor activity of an innovative enterprise makes severe demands on staff, and it takes time to achieve optimal adaptation. However, there is no desire to reduce the level of innovation in these conditions, which indicates that WB young engineers are not suffering. At an ordinary enterprise, staff young staff get tired not so much from labor as from organizational conditions.

When assessing the state of health by staff, an ordinary enterprise, and an innovative enterprise as a whole have no differences in young groups and among middle-aged women. Differences appear in middle-aged men and an increase in older groups, which indicates that employees of an innovative enterprise feel better at older ages than their peers in an ordinary enterprise. A more interesting picture is the state of self-assessment of the state of the cardiovascular, nervous systems of the personnel of both enterprises. Statistically significant differences in favor of an innovative enterprise are recorded in all age groups. These indicators are not chosen by chance. It is these systems that are most sensitive to the stress experienced by employees.

Moreover, stress is a dominant factor in aging and poor health. If we turn to the data on organizational stress, we can see that in all age groups, stress is statistically significantly higher for an ordinary enterprise, and it manifests itself most strongly in a group of young engineers. Thus, it can be assumed that older personnel have more experience in hierarchical management, are less keen on existing organizational conditions, and find more effective ways to relieve stress. Nevertheless, an extended stay in stressful conditions over time affects the state of the cardiovascular and nervous systems, the general sense of health. There are, of course, general trends in assessing the state of health by employees of an ordinary enterprise and an innovative enterprise. One of the significant trends is the deterioration of the state of the cardiovascular system with age. Nevertheless, self-esteem in an older group for an innovative enterprise is significantly better than that of their peers for an ordinary enterprise (2.1 versus 0.7, respectively).

Concluding the analysis of the manifestations of WB staff, an innovative enterprise, and an ordinary enterprise, it should be noted how much they manifest themselves in the psychological well-being of employees in labor collectives. In all age and gender groups, psychological well-being in work collectives is worse than an ordinary enterprise. Except for the older group, indicators are in the negative zone. This trend indicates that new requirements are worsening WB, reinforcing the desire to return to

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previous and even better organizational conditions, strengthening the clan component of organizational culture.

What are the effects of the subjective well-being differences of the staff of an ordinary enterprise and an innovative enterprise? The data in table 2 show that the employees of these enterprises differ significantly in their labor involvement in labor activity.

Table 02. Effects of subjective well-being in labor activity on an ordinary enterprise and innovative enterprise

Age	**Company**	**Engagement**			**Self-esteem**	**Estimation of age by managers (in %)**		
		Currently	**After 5 years**	**W**		**younger**	**correspondence to chronological age**	**over**
Up to 35		1.4	1.1	-	10.6	37.5	16.0	46.5
	Innovative enterprise	1.9	2.2	-	-2.8	40.0	26.0	24.0
	U	*	*		**			
36-59	Ordinary Enterprise	1.6	0.6	*	7.3	14.7	15.0	70.3
	Innovative enterprise	1.9	1.6	-	-6.0	33.0	45.0	22.0
	U	T	*		**			
Over 60	Ordinary Enterprise	1.25	0.3	*	8.8	24.5	15.0	60.5
	Innovative enterprise	1.5	1.7	-	-7.4	16.5	45.5	38.0
	U	T	*		**			

In table 2: W – Wilcoxon test, U – Mann-Whitney test, * -$p \leq 0.05$; ** – $p \leq 0.01$, T – trend; "-" – no statistically significant differences

7. Conclusion

1. Subjective well-being depends on organizational conditions, manifested in the organizational culture of the enterprise. In an organizational culture of a market-hierarchical culture with a pronounced innovative component, engineers, regardless of chronological age, have higher statistically significant indicators of subjective well-being than their colleagues and peers in an organizational culture of a hierarchical-clan type.

2. Differences in the whole complex of characteristics of subjective well-being/trouble in different organizational conditions were revealed: adherence to innovative values, experienced stress, tiredness from organizational conditions, the self-esteem of health status, psychological well-being in the work collective.

3. Adherence to innovative values in the context of the transition to a market-innovative paradigm of enterprise development is a factor in subjective well-being, including in the face of a real shortage of innovative values in the organizational culture.

4. Personal involvement in the labor process is the result of subjective well-being in the conditions of organizational changes in the innovation orientation.

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5. Subjective well-being can be considered as an indicator of the socio-psychological age of the employee. It is shown that subjective well-being has. As a result of a younger age-related self-perception of employees, and estimates of the age of employees by their direct managers generally coincide with the age-related self-perception of employees. Personnel involved in the labor process, Committed to innovative values. More cheerful, healthy, undergoing managers perceive organizational changes without distress as younger in all age groups, and older among them have good prospects in continuing to work.

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