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Metacognitive Determination of Job Satisfaction Among Information Technology Professionals

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Abstract

Introduction. Psychological research of professional activity has traditionally relied on ideas about its two main types – object-related and subject-related ones. In our previous studies, we emphasized the need for distinguishing an information-related type, which in the context of global informatization takes a central position (in practical terms) and has a high specificity (in theoretical terms). This study continues to identify this kind of specificity and considers it from the perspective of the metacognitive organization of activity. The results of this study represent the first evidence in favour of the metacognitive determination of job satisfaction which is characteristic of information technology professionals. **Methods**. The sample comprised 235 Russian professionals representing information-related and object-related professions. The study used the following psychological assessment tools: the Michigan Organizational Assessment Questionnaire Job Satisfaction Subscale, the Metacognitive Awareness Inventory, and the inventory for assessing Integrative-Typological Personal Professional Orientation. **Results**. The overall level of metacognitive awareness is a reliable predictor of job satisfaction among information technology professionals. The overall level of metacognitive awareness and the level of metacognitive knowledge may represent a reliable predictor for job satisfaction among the respondents whose professional orientation is highly compliant with information technology professions. In contrast, metacognitive awareness exerts no effect on job satisfaction among representatives of object-related professions including respondents whose professional orientations are in high compliance with this type of profession. **Discussion**. We compared the results of this study with those from previous studies in terms of the level of metacognitive awareness, its interprofessional differences, and job satisfaction. We concluded that information-related professions have specific characteristics that distinguish them from object-related ones in terms of metacognitive determination of job satisfaction.

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Keywords
professional activity, types of activity, information-related type, object-related type, professional orientation, job satisfaction, metacognitive determination, metacognitive awareness, metacognitive knowledge, metacognitive regulation

Highlights
- Job satisfaction is determined by indicators of metacognitive awareness among information technology professionals.
- The determination of job satisfaction by factors of metacognitive awareness is not characteristic of object-related professions. This confirms the presence of specific characteristics of the metacognitive organization of information-related professions which manifest themselves in terms of metacognitive determination of job satisfaction.
- For information-related professions, an increase in the compliance of personal professional orientation with the type of professional activity leads to increase in the metacognitive determination of job satisfaction.

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Introduction
The research problem of this study focuses on the following three perspectives: (a) the type of professional activity, (b) job satisfaction, and (c) its metacognitive determination.

The first perspective is associated with the psychological construct of the 'type of professional activity'. Today's labour sphere is characterized by structural complexity and a variety of professions, specialties, and types of work. Meanwhile, rapid transformations are observed here, which leads to the emergence of new types of labour, the disappearance of previous ones, qualitative changes in the subject and psychological content of existing types of labour. Such processes lead to changes in the current nomenclature of professions and specialties. These objective tendencies complicate the process of psychological classification of labor types. In Russian psychology, the dichotomous classification is still the most traditional; within its framework all types of professional activity are divided according two basic types of relationship – subject-object and subject-subject ones (which we will further designate as object-related and subject-related types of professional activity). However, over the past two decades, the authors of this article have been developing (jointly and separately) ideas related to the fact that in today's conditions this dyad considerably reduces the actual phenomenology of the labour sphere. Therefore, it should be expanded to a triad by adding another basic type of activity that is related to interaction with information (instead of individuals or material objects) (Lenkov, 2001). This third 'subject-information' type (hereinafter we will designate it as 'information-related') suggests a considerable specificity that distinguishes it from the two traditional types in terms of the structural and functional organization of activity (Karpov, 2018; Karpov & Lenkov, 2006) and psychological requirements in relation to the subject of labor (Rubtsova, 2011). Obviously, the subject-related type of labor

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is not related to either object-related or information-related ones. Therefore, the main issue here is the differentiation of the object-related and the information-related types. This study aims to analyze a new previously unexplored perspective of such a differentiation associated with the metacognitive determination of job satisfaction.

Accordingly, the second aspect of the problem is associated with job satisfaction, for which many theoretical concepts have been developed (see Davidescu, Apostu, Paul, & Casuneanu, 2020; Izvercian, Potra, & Ivascu, 2016), its psychological and other predictors (see Berta et al., 2018; Brunelle & Fortin, 2021; Wijngaards, Burger, & van Exel, 2021). Similar studies were carried out in relation to professions, which, in our terminology, represent object and information types. For example, a recent study of Jordanian civil engineers (object-based occupations) found that the most significant predictors of overall job satisfaction are the work environment, pay and benefits, coworker satisfaction, and satisfaction with control (Alzubi, Alkhateeb, & Hiyassat, 2021). In turn, in a study of 4207 Spanish IT professionals (information type of profession), job position, teamwork atmosphere, leadership, recognition and compensation, physical and personal conditions were considered as predictors of job satisfaction (Crespi-Vallbona & Mascarilla-Miró, 2018).

However, we could not find any studies that consider metacognitive properties similar to metacognitive awareness as predictors of job satisfaction. On the other hand, some studies have found correlations between job satisfaction and organizational and psychological factors such as organizational commitment, job involvement, intention to quit the job, etc. (see Ensour, Zeglat, & Shrafat, 2018; Wijngaards et al., 2021). In turn, metacognition is an important factor in the organizational aspects of group work (Splichal, Oshima, & Oshima, 2018) and, therefore, can be associated with overall job satisfaction, which implicitly includes an assessment of interactions in the organization. Thus, we assumed that job satisfaction may have metacognitive determination at least for some types of labour.

Accordingly, the third perspective of the issue is associated with the metacognitive determination of professional activity and the characteristics of the subject of labor. The issue of metacognitive determination of development, behavior, and activity has been studied for many decades. A wide variety of self-reports have been developed to measure various components of metacognition. A systematic review of such assessment tools is presented, for example, by Craig, Hale, Grainger, & Stewart (2020). However, such studies often involve non-professional social groups distinguished by gender, age, type of education, and sociocultural differences (for example, Babikova, Mal'tseva, Startseva, & Turkina, 2018; Abdelrahman, 2020; Anumudu, Adebayo, Gboyega-Tokunbo, Awobode, & Isokpehi, 2019; Martirosov & Moser, 2021; Pradhan & Das, 2021) and are less relevant for professional groups. If we systematize and generalize recent studies for professional groups, it turns out that they more often involve representatives (often only future ones, i.e., students) of the subject-related professions: teachers, physicians, managers, etc. (see, for example, Gutierrez de Blume & Montoya, 2021). Only a few studies of the metacognitive determination of professional activity for object-related and, especially, information-related types of professions provide fragmentary information (in relation to the spectrum of professions and types of labor that represent this type). Examples include studies involving so-called ‘novice programmers’ (for example, Rum & Ismail, 2016) who, in fact, are university and college students in information technology professions studying programming courses. A brief overview of such studies is presented, for example, by Prather et al. (2018). However, we failed to find any studies that consider the metacognitive determination of job satisfaction in object-related and information-related professions.

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Thus, our research problem was to elucidate possible common and specific features of metacognitive determination of job satisfaction for professions of object-related and information-related types, which have been previously combined within a single subject-object type. This study *aims* to compare the metacognitive determination of job satisfaction in object-related and information-related professions.

Methods

Sample and procedure

The study sample comprised 300 individual participants equally representing object-related and information-related professions (150 people for each group, including 75 males and 75 females). When selecting applicants for participation, we checked compliance with the following two requirements: (a) non-management job responsibilities (lack of managerial functions at a level higher than management of individual assistants) and (b) job responsibilities when interaction with others is not very frequent and does not constitute their main content. The presence of both permanent managerial functions and intense subject interactions brings such activities into integrative types that differ considerably from the basic ones (Rubtsova, 2011). Therefore, both requirements are designed to ensure the selection of representatives of 'pure' object-related and information-related types.

The respondents who gave written informed consent to participate in the study (n = 249) filled out the questionnaires (a) in-person, using paper form (n = 44), (b) in-person, using electronic Google Form, filled in the presence of the experimenter (n = 69) and (c) remotely, using electronic Google Form (n = 136). After completing the questionnaires, we excluded the respondents who did not meet our study requirements, as well as cases of erroneous, inaccurate, or missing responses (n = 14). Thus, 78.3 % of the original number of respondents remained in the sample.

The final sample comprised 235 employed men and women aged 19–59 years, residing in nine cities of Russia (Tver, n = 6; Moscow, n = 62; St. Petersburg, n = 49; other cities, n = 58), representing object-related (n = 119) and information-related (n = 116) professions. The information-related professions were as follows: programmer, technical editor, web designer, data entry operator, statistician, IT engineer, system administrator, software tester, database administrator, and video game developer. The object-related professions were as follows: heating networks engineer, electrician, electronics engineer, technologist, builder, master builder, radiologist, dental prosthetist, locomotive driver, microbiologist, chemist, restorer, sound technician, veterinarian, electrician. Table 1 shows other characteristics of the sample.

Table 1

Characteristics of respondents

Variables	Entire sample (n = 235)	Types of professions: Information-related type (n = 119)	Types of professions: Object-related type (n = 116)	p
Gender				
Males	130 (55.3 %)	64 (53.8 %)	66 (56.9 %)	0.631
Females	105 (44.7 %)	55 (46.2 %)	50 (43.1 %)	

Table 1

Characteristics of respondents

Variables	Entire sample (n = 235)	Types of professions: Information-related type (n = 119)	Types of professions: Object-related type (n = 116)	p
Age				
< 31 years	134 (57.0 %)	73 (61.3 %)	61 (52.6 %)	0.325
31–45 years	88 (37.4 %)	39 (32.8 %)	49 (42.2 %)	
> 45 years	13 (5.5 %)	7 (5.9 %)	6 (5.2 %)	
Work experience in the profession				
< 6 years	62 (57.0 %)	53 (52.1 %)	61 (45.7 %)	0.393
6–15 years	49 (37.4 %)	49 (33.6 %)	49 (42.2 %)	
> 15 years	17 (5.5 %)	14 (14.3 %)	6 (12.1 %)	

Note: here *p* is the asymptotic two-way significance level of differences according to Pearson's chi-square test.

Measurements

We measured *job satisfaction* using the Michigan Organizational Assessment Questionnaire Job Satisfaction Subscale (MOAQ-JSS) (Cammann, Fichman, Jenkins, & Klesh, 1983). This questionnaire measures overall job satisfaction and consists of three items (wording was direct for items 1 and 3 and reverse for item 2) describing the individual's subjective reactions to his/her work in the organization. A 7-point scale was used to assess the statements in the original version; in subsequent studies, other scales were also widely used, including a 5-point scale. The questionnaire is well known and has been proven to be reliable and valid in numerous studies (Bowling & Hammond, 2008). We failed to find any Russian-language modification of this diagnostic tool. Therefore, taking into account its simplicity, we used our own translation, which authenticity was verified by professional translators. We used a 5-point Likert-type scale ranging from 1 to 5 where 1 equaled strongly disagree and 5 equaled strongly agree. The responses to item 2 were reversed before processing. Job satisfaction was calculated as the sum of the three items. Cronbach's alpha coefficient for the MOAQ-JSS was 0.939 for all the subjects (n = 235).

We measured *metacognitive awareness* using the Metacognitive Awareness Inventory (MAI) (Schraw & Dennison, 1994). The MAI has deep theoretical foundations that summarize the

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findings reported by numerous authors, including A. L. Brown, D. R. Cross, J. H. Flavell, R. H. Kluwe, S. G. Paris, and others (Lim & Ng, 2011). Currently, the MAI has been modified in many languages; it is one of the most widely used self-reports for characterizing metacognition (Craig et al., 2020; Xethakis, 2020). This inventory contains 52 items that assess an overall score of metacognitive awareness calculated as the sum of scores for the following two scales: (a) the KC scale (17 items), 'metacognitive knowledge' (Knowledge of Cognition) that contains 3 subscales – Declarative Knowledge (DK), Procedural Knowledge (PK), and Conditional Knowledge (CK); (b) the RC scale (35 items), 'metacognitive regulation' (Regulation of Cognition) that contains 5 subscales – Planning (PL), Information Management Strategies (IMS), Comprehension Monitoring (CM), Debugging Strategies (DS), and Evaluation (EV). We compared this structure of the MAI with the table of elements of metacognition identified by various authors as presented in the study by Lim & Ng (2011) and observed considerable theoretical stability of this structure provided by the fact that the MAI components are clearly related to many components of metacognition identified in later studies.

In our study, we used a Russian-language version of the MAI modified by A. V. Karpov and M. I. Skityaeva (Karpov & Skityaeva, 2005). Here, the original formulations of the inventory related to learning are replaced by formulations related to professional activities (for example, 'my teacher' – 'my chief', 'in my training' – 'in my job'). Containing all the 52 items of the inventory, this modification, however, does not use its scale and subscale structure; here, the authors recommended to find only the total score for all the items. Nevertheless, several subsequent studies tested this adaptation using the structure of scales and/or subscales corresponding to the original version (for example, Babikova et al., 2018). In this regard, we also initially planned to use the full-structure MAI. To assess the responses we used a 5-point Likert-type scale ranging from 1 to 5 where 1 equaled strongly disagree and 5 equaled strongly agree.

However, in the study sample (n = 235), Cronbach's alpha coefficient was satisfactory for some subscales (0.768 for DK, 0.796 for IMS, and 0.712 for CM) and unsatisfactory for others (0.687 for PK, 0.667 for CK, 0.694 for PL, 0.598 for DS, and 0.697 for EV). Therefore, taking into account the ongoing discussion about the factor validity of both the original MAI (see Craig et al., 2020; Xethakis, 2020) and its Russian-language version (see Byzova, Perikova, & Lovyagina, 2019), we decided to limit ourselves to using two scales – KC 'metacognitive knowledge' (Cronbach's $\alpha = 0.880$) and RS 'metacognitive regulation' (Cronbach's $\alpha = 0.918$), and also the total score of metacognitive awareness MA (0.946). As L. Xethakis noted, "there is more evidence that the MAI has two main dimensions" (Xethakis, 2020, p. 125). In addition, in recent studies many authors have confirmed the validity of the two-factor structure of the MAI or its modifications (e.g. Abdelrahman, 2020; Gutierrez de Blume & Montoya, 2021; Martirosov & Moser, 2021).

We measured *professional orientation* using the inventory for measuring Integrative and Typological Personal Professional Orientation (IPO) (Rubtsova, 2011). In our study we used only three scales of the IPO that characterize orientation towards activities of the corresponding type: object-related orientation (OB, 7 items), subject-related orientation (SUB, 8 items), information-related orientation (INF, 9 items). Cronbach's alpha coefficients were 0.885, 0.884, and 0.813 for the OB, SUB, and IBF scales, respectively.

To *analyze the data*, we used the methods of correlation analysis and ANOVA, as well as methods for testing statistical hypotheses.

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Results

The characteristics of the sample (Table 1) show that the groups distinguished by the type of activity are equivalent in terms of distributions by gender, age, and work experience. By the mean scores (Table 2), the groups turned out to be equivalent in terms of age, work experience, job satisfaction, metacognitive knowledge, metacognitive regulation and awareness, and professional orientation towards the subject-related professions. Meanwhile, as expected for the representatives of information-related professions, orientation towards this type of professions was significantly higher and orientation towards the object-related type was lower (see Table 2).

Table 2

Mean scores and standard deviations

Variables	Entire sample (n = 235)	Types of professions		p
		Information-related type (n = 119)	Object-related type (n = 116)	
Age	31.06 (7.171)	30.95 (7.407)	31.16 (6.952)	0.709
Work experience	7.54 (6.170)	7.26 (6.629)	7.82 (5.686)	0.128
UD	12.29 (2.404)	12.16 (2.633)	12.43 (2.148)	0.924
KC	64.25 (5.971)	64.41 (6.640)	64.08 (5.221)	0.412
RC	134.18 (9.884)	133.36 (11.570)	135.02 (7.747)	0.560
MA	198.43 (15.146)	197.77 (17.692)	199.09 (12.030)	0.938
OB	22.59 (4.353)	19.19 (3.112)	26.07 (2.117)	**0.000**
SUB	18.67 (5.185)	17.92 (4.503)	19.43 (5.721)	0.051
INF	32.10 (6.626)	37.68 (3.430)	26.37 (3.455)	**0.000**

Notes: UD – job satisfaction, *KC* – metacognitive knowledge, *RC* – metacognitive regulation, *MA* – metacognitive awareness; *OB*, *SUB*, *INF* – professional orientation towards the types of professions (object-related, subject-related, and information-related, respectively); *p* is the asymptotic two-way significance level of differences according to the Mann–Whitney test; scores of $p < 0.05$ are highlighted in bold.

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Significant correlations were found only within the structure of the MAI both for the entire sample and for professional groups (see Table 3). Thus, no significant correlations between job satisfaction and indicators of metacognitive awareness were found. More precisely, for a given group size, these correlations 'failed to reach' the level of statistical significance for information-related professions (see Table 3).

Table 3

Spearman correlations coefficients between job satisfaction and factors of metacognitive awareness

Variables	2 KC	3 RC	4 MA
Entire sample (n = 235)			
1. Job Satisfaction (UD)	0.019	0.038	0.045
2. Metacognitive Knowledge (KC)		**0.747****	**0.901****
3. Metacognitive Regulation (RC)			**0.943****
4. Metacognitive Awareness (MA)			
Information-related type (n = 119)			
1. Job Satisfaction (UD)	0.118	0.101	0.128
2. Metacognitive Knowledge (KC)		**0.819****	**0.935****
3. Metacognitive Regulation (RC)			**0.953****
4. Metacognitive Awareness (MA)			
Object-related type (n = 116)			
1. Job satisfaction (UD)	–0.089	0.000	–0.025
2. Metacognitive Knowledge (KC)		**0.647****	**0.857****
3. Metacognitive Regulation (RC)			**0.924****
4. Metacognitive Awareness (MA)			

Notes: ** $p < 0.05$; *** $p < 0.01$; values of $p < 0.05$ are highlighted in bold.

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Further verification was carried out using one-way ANOVA. For each factor, we distinguished subgroups corresponding to its low, average, and high levels and representing approximately 23 %, 54 % and 23 % of the group size, respectively (see Tables 4 and 5). Multiple comparisons were performed using the Games–Howell test, which does not require the equality of subgroup sizes and the homogeneity of variances. We assessed the impact of factors using the eta-squared values.

To examine the correspondence between professional orientation and the type of professional activity in each group, we carried out compliance adjustment and selected the respondents with a higher compliance. We used the following empirical criteria: (a) for the *information-related group* – the orientation towards this type is higher than among 10 % of the group; the orientation towards object-related and subjective-related types is lower than among 20 %; 82 individual participants remained in the compliance-adjusted group, that is, 68.9 % of the group size (see Table 4); (b) for the *object-related group* – the orientation towards this type is higher than among 20 % of the group; the orientation towards the information-related type is lower than among 30 %; the orientation towards the subject-related type is lower than among 25 %; 83 individual participants remained in the compliance-adjusted group, that is, 71.6 % of the group size (see Table 5).

A significant influence of metacognitive awareness on job satisfaction was observed in the initial group of information-related professions. Meanwhile, in the compliance-adjusted group this effect remained significant and the effect size increased (see Table 4).

Table 4

The impact of metacognitive awareness factors on job satisfaction (information-related professions)

Factors	ANOVA			Mean scores			Post hoc test		
	F	p	η^2	M1	M2	M3	1–2	1–3	2–3
Initial group (n = 119)									
KC	2.667	0.074	0.044	11.52 n = 29	12.09 n = 67	13.17 n = 23	0.676	0.083	0.118
RC	3.484	0.034[a]	0.057	11.04 n = 28	12.48 n = 62	12.55 n = 29	0.126	0.141	0.990
MA	4.233	**0.017**	**0.068**	11.04 n = 28	12.30 n = 64	13.00 n = 27	0.202	0.036	0.309

Table 4

The impact of metacognitive awareness factors on job satisfaction (information-related professions)

Factors	ANOVA			Mean scores			Post hoc test		
Compliance-adjusted group (n = 82)									
KC	4.147	**0.019**	**0.095**	12.47 n = 17	12.24 n = 49	14.00 n = 16	0.923	0.042	0.002
RC	2.085	0.131	0.050	11.88 n = 17	12.60 n = 45	13.35 n = 20	0.619	0.178	0.299
MA	3.425	**0.037**	**0.080**	11.88 n = 17	12.48 n = 46	13.68 n = 19	0.712	0.065	0.027

Notes: [a] does not endure multiple comparisons; *F* – Fisher statistics, *p* – statistical significance level (ANOVA), η^2 – eta-squared; mean scores – mean scores of job satisfaction for subgroups by the following expression levels of factors: low (*M1*), average (*M2*), and high (*M3*); *Post hoc test* – significance of differences in multiple comparisons of subgroups; *KC* – metacognitive knowledge, *RC* – metacognitive regulation, *MA* – metacognitive awareness; values of *p* and η^2 corresponding to a statistically significant effect (when $p < 0.05$ for both ANOVA and multiple comparisons) are highlighted in bold.

Unlike the previous group, in the group of object-related professions metacognitive awareness factors had no significant influence on job satisfaction – neither in the initial group nor in the compliance-adjusted one (see Table 5).

Table 5

The impact of metacognitive awareness factors on job satisfaction (object-related professions)

Factors	ANOVA			Mean scores			Post hoc test		
	F	p	η^2	M1	M2	M3	1–2	1–3	2–3
Initial group (n = 116)									
KC	0.023	0.977	0.000	12.36 n = 28	12.47 n = 45	12.44 n = 43	0.982	0.989	0.998

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Table 5

The impact of metacognitive awareness factors on job satisfaction (object-related professions)

Factors	ANOVA			Mean scores			Post hoc test		
	F	p	η^2	M1	M2	M3	1–2	1–3	2–3
RC	2.851	0.062	0.048	11.58 n = 26	12.78 n = 46	12.57 n = 44	0.236	0.363	0.776
MA	0.719	0.489	0.013	12.15 n = 27	12.36 n = 56	12.79 n = 33	0.946	0.576	0.421
Compliance-adjusted group (n = 83)									
KC	0.492	0.613	0.012	12.60 n = 20	12.44 n = 36	12.00 n = 27	0.974	0.695	0.662
RC	0.791	0.457	0.019	11.91 n = 23	12.67 n = 33	12.30 n = 27	0.599	0.874	0.595
MA	0.279	0.757	0.007	12.43 n = 21	12.17 n = 42	12.60 n = 20	0.935	0.969	0.539

Notes: see Table 4.

Discussion

In previous studies, factors such as gender, age, work experience, education, position, socio-cultural characteristics, material incentives, abilities, responsibilities, specific characteristics of professional communication, opportunities for professional self-realization, organizational climate, work stress, etc. were identified as determinants of job satisfaction (see, for example, Davidescu et al., 2020). Obviously, for the first time we considered factors of metacognitive awareness as such predictors in relation to object-related and information-related professions. Therefore, we may compare our results with those from other studied only indirectly, checking the correctness of the procedure of our study. For example, in our study the mean score of metacognitive awareness (M = 198.43) for working professionals, turned out to be higher (significantly or somewhat) than

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the scores obtained in a number of studies using the MAI in samples of students, for example: (a) M = 192.1 (Byzova et al., 2019, p. 130); (b) M = 37.2 using a rating scale of 0–1 (Babikova et al., 2018, p. 11), which corresponds to M = 186.0 using a rating scale of 1–5; (c) M = 197.12 for male students and M = 197.15 for female students (Jain, Tiwari, & Awasthi, 2017, p. 127); (d) for male students (n = 60), metacognitive knowledge M = 65.5 and metacognitive regulation M = 111.2; for female students (n = 140), metacognitive knowledge M = 79.1 and metacognitive regulation M = 121.3 (Abdelrahman, 2020, p. 4 of 8); these data correspond to the mean score of metacognitive awareness for the total sample size (N = 200), equal to M = 195.66. As expected, metacognition develops with age and professional experience, at least during the transition from the typical student age to the age of 24–38 years, which is characteristic of our sample (see Table 1).

However, in a number of studies involving student samples that applied a continuous rating scale of 0–100 %, mean scores were higher than in our study: a) 77 % (pretest) and 84 % (posttest) (Martirosov & Moser, 2021) that corresponds to M = 200.2 (pretest) and M = 218.4 (posttest) using a rating scale of 1–5; b) 80.5 % (Anumudu et al., 2019, p. 188), which corresponds to M = 209.3 using a rating scale of 1–5. Such differences may be explained both by specific features of the rating scale and socio-cultural characteristics.

In our study, the mean score metacognitive awareness was significantly higher than the score of 37.2 in the study of social (non-professional) English-speaking sample aged 16 to 79 years (mean age = 33.1) using a rating scale of 0–1 (Song, Loyal, & Lond, 2021, p. 7 of 14), which corresponds to M = 168.2 using a rating scale of 1–5.

The MAI has also been used to identify the relationship between metacognitive awareness and academic performance when university students take an introductory computer programming course (Rum & Ismail, 2016). Thus, this study is somehow concerning information technology professionals (although potential ones). Strong positive correlations of metacognitive awareness (MA) with metacognitive knowledge (KC) (r = 0.9257) and metacognitive regulation (RC) (r = 0.9764), as well as the correlation coefficient r = 0.8347 between KC and RS (Rum & Ismail, 2016, p. 673), are qualitatively consistent with our findings from the sample of employed information technology professionals (rho = 0.935 between MA and KC, rho = 0.953 between MA and RC, rho = 0.819 between KC and RC; see Table 3). However, in the aforementioned study of students, the mean scores were 36.51 for MA, 11.76 for KC, 24.75 for RC (using a rating scale of 0–1) (Rum & Ismail, 2016, p. 671), which corresponds to the scores of 182.55, 58.80 and 123.75, respectively (using a rating scale of 1–5); these scores are significantly lower than those obtained in our study from the sample of employed information technology professionals (197.77, 64.41 and 133.36, respectively; see Table 2).

In our study, metacognition indicators differed between representatives of the information-related and object-related professions. Similar interprofessional differences (between areas of professional training, not types of professions) were revealed in the study that used the MAI to compare university undergraduate students of three specialties – psychologists, teachers, and physicians. As a result, multiple differences were observed between physicians and psychologists, and between physicians and teachers; few differences were found between psychologists and teachers (Gutierrez de Blume & Montoya, 2021).

Another similar study compared university students whose study programs were related to three areas of biology: natural biological sciences (botany, microbiology, zoology), medical sciences (medicine, biochemistry, psychotherapy, veterinary medicine, etc.) and agricultural sciences

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(aquaculture and fisheries, agriculture, zootechnics) (Anumudu et al., 2019, p. 187). This division does not correspond to certain types of professions. The groups of agricultural sciences and natural biological sciences are, rather, object-related; the group of medical sciences is less distinct. Thus, professionals in psychotherapy are, obviously, representatives of the subject-related type, and professionals in veterinary medicine are representatives of the object-related type. However, in case of university students, the areas of their training are not directly related to a specific profession. Consequently, the initial differences between the groups are not so much professionally as educationally conditioned. Although we found significant differences in the combined effect of the training program and the year of education, mean scores for overall metacognitive awareness, metacognitive knowledge, and metacognitive regulation did not statistically differ between groups (Anumudu et al., 2019, pp. 188–191). However, from the standpoint of the conceptual foundations of our study, such influence already refers to the joint influence of the objective environment of activity (which, in fact, is generalized in the object-, subject- and information-related types) and the level of its complexity, which generalization requires a qualitatively different basic classification feature – the level of organization and regulation of activity (see Rubtsova, 2011).

Although certain differences, the mean scores and intercorrelations of metacognitive awareness indicators obtained from our study are, in general, qualitatively consistent with the results of other studies. A similar situation is observed for the mean of job satisfaction obtained using the MOAQ-JSS subscale. The score of M = 12.29 obtained in our study using a rating scale of 1–5 is (a) much higher than the mean score of 1.89 (averaged for the three items of the subscale) obtained on a sample of Canadian social workers (Berta et al., 2018, p. 7 of 11), corresponding to M = 5.67 (without averaging); (b) only slightly higher than the mean score of 5.621 (using the scale of 1–7, based on averaging) obtained from a sample of employees of a large Canadian information technology (IT) consulting company (Brunelle & Fortin, 2021, p. 7 of 11), corresponding to M = 12.045 (using a scale of 1–5, without averaging); (c) higher than the mean score of 5.13 (using a scale of 1–7, based on averaging) obtained on a sample of unclassified workers (mean age = 35.1 years; mean working experience in the organization = 5.2 years, of which 32.6 % held a managerial position) (Wijngaards et al., 2021, p. 14 of 27) corresponding to M = 10.99 (using a scale of 1–5, without averaging).

For the respondents whose professional orientation is highly consistent with the type of profession (n = 165, see Tables 4 and 5) the mean job satisfaction score of M = 12.48 turned out to be somewhat higher in the group with less correspondence (n = 70, M = 11.84). This finding is consistent with the current view of the role of professional interests. There has been a long debate over whether the degree of satisfaction has a significant impact on job satisfaction. However, a recent meta-analysis covering 105 studies performed over 65 years found a generalized statistically significant positive association between interests and overall job satisfaction (Hoff, Song, Wee, Phan, & Rounds, 2020).

We may also discuss the results obtained in our study in a more general and fundamental context. For example, as W. Berta et al. have shown in a study of social workers, there are multiple and significant relationships between the characteristics of the work environment (organizational support, perception of workplace safety, etc.), attitudes towards work (involvement in work, organizational commitment, job satisfaction, etc.) and work results (intention to stay/quit, labor productivity, etc.) (Berta et al., 2018). Therefore, metacognitive determination of job satisfaction can play a role that goes far beyond the subjective well-being of employees. As W. Berta et al. noted,

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even minor changes in the work environment can lead to "a cascade of positive consequences for work results through attitudes towards work" (Berta et al., 2018, p. 1 of 11). According to these authors, job satisfaction refers specifically to the attitude towards work (Berta et al., 2018, p. 5 of 11) and may be increased not only by changing the work environment. As our study shows, for information-related professions such an increase in job satisfaction can be achieved by developing metacognitive abilities of employees.

Thus, increasing job satisfaction can be important for work performance (individual performance and organizational effectiveness as a whole), as well as for employees' professional development. For example, various aspects of job satisfaction can have a significant impact on employees' motivation to learn (Ensour et al., 2018), and, therefore on the motivation for the development of metacognitive skills. Thus, the metacognitive determination of job satisfaction seems to be locked to the potentially possible 'reverse' determination of metacognitive development, which still needs to be tested.

In addition, job satisfaction is a significant predictor of such a key, critical indicator of professional performance as intention to quit. For example, meta-analysis has shown that low job satisfaction is the most frequently identified predictor of quit intentions among IT professionals (representing, in our terminology, an information-related type of professions) (Joseph, Ng, Koh, & Ang, 2007, p. 550).

In turn, the development of employees' metacognitive abilities (including for information-related professions) should be carried out in a specific professional and organizational context. The fact that the MAI is developed for creating its professionally oriented versions indirectly confirms this conclusion (e.g., modifications of the Metacognitive Awareness Inventory for Teachers (MAIT) (for example, Gutierrez de Blume & Montoya, 2020).

Some authors agree that there is a need for professional specification of the formation of metacognitive abilities. Thus, encouraging individuals to use new strategies and approaches to decision-making should take into account specific professional situations, their personality traits, and individual preferences (Colombo, Iannello, & Antonietti, 2010). However, the verification of such complex hypotheses requires, obviously, new independent studies.

Summing up, we should note that the modern competitive environment requires the development of a knowledge-based economy, as well as the search for innovative approaches to personnel management and the formation of organizational culture. Therefore, in today's economy, organizations often turn to an important intrinsic property and resource – their employees (Brunelle & Fortin, 2021; Izvercian et al., 2016), realizing the necessary transition from the consumption of human resources to their development (Davidescu et al., 2020). Within the framework of this trend, in our study we examined two important and interrelated characteristics of such an intrinsic resource – job satisfaction and metacognitive awareness.

The limitations of this study may be associated with a relatively small sample size, shortcomings of diagnostic tools, and socio-cultural characteristics of the types of professional activity. Obviously, this study is 'exploratory' in nature. However, its findings indicate the need for its expansion and deepening.

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References

Abdelrahman, R. M. (2020). Metacognitive awareness and academic motivation and their impact on academic achievement of Ajman University students. *Heliyon*, *6*(9), e04192. https://doi.org/10.1016/j.heliyon.2020.e04192

Alzubi, K. M., Alkhateeb, A. M., & Hiyassat, M. A. (2021). Factors affecting the job satisfaction of construction engineers: Evidence from Jordan. *International Journal of Construction Management*. https://doi.org/10.1080/15623599.2020.1867945

Anumudu, C. I., Adebayo, A., Gboyega-Tokunbo, A., Awobode, H., & Isokpehi, R. D. (2019). Self-assessed metacognitive awareness among students of the University of Ibadan, Nigeria. *Journal of Educational and Social Research*, *9*(3), 185–193. https://doi.org/10.2478/jesr-2019-0036

Babikova, N. N., Mal'tseva, O. A., Startseva, E. N., & Turkina, M. S. (2018). A study of metacognitive awareness of university students. *Vestnik Mariiskogo gosudarstvennogo universiteta (Vestnik of the Mari State University)*, *12*(3), 9–16. https://doi.org/10.30914/2072-6783-2018-12-3-9-16 (in Russ.).

Berta, W., Laporte, A., Perreira, T., Ginsburg, L., Dass, A. R., Deber, R., … Neves, P. (2018). Relationships between work outcomes, work attitudes and work environments of health support workers in Ontario long-term care and home and community care settings. *Human Resources for Health*, *16*, 15. https://doi.org/10.1186/s12960-018-0277-9

Bowling, N. A., & Hammond, G. D. (2008). A meta-analytic examination of the construct validity of the Michigan Organizational Assessment Questionnaire Job Satisfaction Subscale. *Journal of Vocational Behavior*, *73*(1), 63–77. https://doi.org/10.1016/j.jvb.2008.01.004

Brunelle, E., & Fortin, J.-A. (2021). Distance makes the heart grow fonder: An examination of teleworkers' and office workers' job satisfaction through the lens of self-determination theory. *SAGE Open*, *11*(1). https://doi.org/10.1177/2158244020985516

Byzova, V. M., Perikova, E. I., & Lovyagina, A. E. (2019). Metacognitive involvement in the system of mental self-regulation of students. *Sibirskii psikhologicheskii zhurnal (Siberian Journal of Psychology)*, 73, 126–140. https://doi.org/10.17223/17267080/73/8 (in Russ.).

Cammann, C., Fichman, M., Jenkins, G., & Klesh, J. (1983). Assessing the attitudes and perceptions of organizational members. In S. E. Seashore, E. E. Lawler, P. H. Mirvis, & C. Cammann (Eds.), *Assessing organizational change: A guide to methods, measures, and practices* (pp. 71–138). New York: John Wiley and Sons.

Colombo, B., Iannello, P., & Antonietti, A. (2010). Metacognitive knowledge of decision-making: An explorative study. In A. Efklides, P. Misailidi (Eds.), *Trends and prospects in metacognition research* (pp. 445–472). Boston: Springer. https://doi.org/10.1007/978-1-4419-6546-2_20

Craig, K., Hale, D., Grainger, C., & Stewart, M. E. (2020). Evaluating metacognitive self-reports: Systematic reviews of the value of self-report in metacognitive research. *Metacognition and Learning*, *15*, 155–213. https://doi.org/10.1007/s11409-020-09222-y

Crespi-Vallbona, M., & Mascarilla-Miró, O. (2018). Job satisfaction. The case of information technology (IT) professionals in Spain. *Universia Business Review*, 36–51. https://doi.org/10.3232/UBR.2018.V15.N2.02

Davidescu, A. A., Apostu, S.-A., Paul, A., & Casuneanu, I. (2020). Work flexibility, job satisfaction, and job performance among Romanian employees – Implications for sustainable human resource management. *Sustainability*, *12*(15). https://doi.org/10.3390/su12156086

Ensour, W., Zeglat, D., & Shrafat, F. (2018). Impact of job satisfaction on training motivation. *Problems and Perspectives in Management*, *16*(3), 337–355. https://doi.org/10.21511/ppm.16(3).2018.27

Gutierrez de Blume, A. P., & Montoya, D. (2020). El Inventario de Conciencia Metacognitiva para Docentes (MAIT): Adaptación cultural y validación en una muestra de docentes colombianos [The Metacognitive Awareness Inventory for Teachers (MAIT): Cultural adaptation and validation in a sample of Colombian teachers]. *Psychologia*, *14*(1), 115–130. https://doi.org/10.21500/19002386.4584

Gutierrez de Blume, A. P., & Montoya, D. M. (2021). Differences in metacognitive skills among undergraduate students in education, psychology, and medicine. *Revista Colombiana de Psicología*, *30*(1), 111–130. https://doi.org/10.15446/rcp.v30n1.88146

Hoff, K. A., Song, Q. C., Wee, C. J. M., Phan, W. M. J., & Rounds, J. (2020). Interest fit and job satisfaction: A systematic review and meta-analysis. *Journal of Vocational Behavior*, 123. https://doi.org/10.1016/j.jvb.2020.103503

Izvercian, M., Potra, S., & Ivascu, L. (2016). Job satisfaction variables: A grounded theory approach. *Procedia – Social and Behavioral Sciences*, *221*, 86–94. https://doi.org/10.1016/j.sbspro.2016.05.093

Jain, D., Tiwari, G. K., & Awasthi, I. D. (2017). Impact of metacognitive awareness on academic adjustment and academic outcome of the students. *International Journal of Indian Psychology*, *5*(1), 123–138. https://doi.org/10.25215/0501.034

Joseph, D., Ng, K.-Y., Koh, C., & Ang, S. (2007). Turnover of information technology professionals: A narrative review, meta-analytic structural equation modeling, and model development. *MIS Quarterly*, *31*(3), 547–577. https://doi.org/10.2307/25148807

Karpov, A. V. (2018). Towards the subject-information class of activity. *Chelovecheskii faktor: Sotsial'nyi psikholog (The Human Factor: Social Psychologist)*, 2, 12–22. (in Russ.).

Karpov, A. V., & Lenkov, S. L. (2006). *The structural and functional composition of professional activity of an informational nature*. Tver: Tver State University. (in Russ.).

Karpov, A. V., & Skityaeva, I. M. (2005). *Psychology of metacognitive processes of personality*. Moscow: Institute of Psychology, Russian Academy of Sciences. (in Russ.).

Lenkov, S. L. (2001). *Subject-informational approach to psychological research*. Tver: Tver State University. (in Russ.).

Lim, K. S., & Ng, P. L. (2011). Examining and comparing the factorial validity of the construct of metacognitive awareness across two grade levels. In *Proceedings of the 1st International Conference on World-Class Education (ICWED-2011)*. https://doi.org/10.13140/2.1.1211.4729

Martirosov, A. L., & Moser, L. R. (2021). Team-based learning to promote the development of metacognitive awareness and monitoring in pharmacy students. *American Journal of Pharmaceutical Education*, *85*(2), 848112. https://doi.org/10.5688/ajpe848112

Pradhan, S., & Das, P. (2021). Influence of metacognition on academic achievement and learning style of undergraduate students in Tezpur University. *European Journal of Educational Research*,

10(1), 381–391. https://doi.org/10.12973/eu-jer.10.1.381

Prather, J., Pettit, R., McMurry, K., Peters, A., Homer, J., & Cohen, M. (2018). Metacognitive difficulties faced by novice programmers in automated assessment tools. In *Proceedings of the 2018 ACM Conference on International Computing Education Research* (pp. 41–50). https://doi.org/10.1145/3230977.3230981

Rubtsova, N. E. (2011). *Integrative-typological professional orientation of personality*. Tver: Moscow Humanitarian and Economic Institute, Tver Branch. (in Russ.).

Rum, S., & Ismail, M. (2016). Metacognitive awareness assessment and introductory computer programming course achievement at university. *The International Arab Journal of Information Technology*, *13*(6), 667–676.

Schraw, G., & Dennison, R. S. (1994). Assessing metacognitive awareness. *Contemporary Educational Psychology*, *19*(4), 460–475. https://doi.org/10.1006/ceps.1994.1033

Song, J. H. H., Loyal, S., & Lond, B. (2021). Metacognitive Awareness Scale, Domain Specific (MCAS-DS): Assessing metacognitive awareness during Raven's Progressive Matrices. *Frontiers in Psychology*, *11*, 607577. https://doi.org/10.3389/fpsyg.2020.607577

Splichal, J. M., Oshima, J., & Oshima, R. (2018). Regulation of collaboration in project-based learning mediated by CSCL scripting reflection. *Computers & Education*, *125*, 132–145. https://doi.org/10.1016/j.compedu.2018.06.003

Wijngaards, I., Burger, M., & van Exel, J. (2021). Unpacking the quantifying and qualifying potential of semi-open job satisfaction questions through computer-aided sentiment analysis. *Journal of Well-Being Assessment*. https://doi.org/10.1007/s41543-021-00040-w

Xethakis, L. (2020). The psychometric properties of the Metacognitive Awareness Inventory in the Japanese EFL context. *Kumamoto University Studies in Social and Cultural Science*, *18*, 121–146. Retrieved from https://researchmap.jp/ljxethakis/published_papers/24714137

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Author Contributions

A. V. Karpov supervised the publication having applied the principle of metacognitive organization of activities in information-related professions and theoretically generalized the results.
S. L. Lenkov developed the design of the publication using the subject-information approach to the study of information activities, conducted a meta-analysis of previous publications related to the examined issues, performed statistical processing of the results, and interpreted findings.
E. N. Rubtsova developed the experimental design, conducted the study using the inventory for assessing Integrative and Typological Personal Professional Orientation, collected data, and interpreted findings.

The authors declare no conflicts of interest.