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# Employers' Assessment of Competences of the Employees of the Shipbuilding, Forestry and Fishing Industries of the Arkhangelsk Oblast in the Context of the Development of Digitalization and Automation of Production

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**Abstract.** The article is devoted to the study of employers' perceptions of the competences of employees in the shipbuilding, fishing and forestry industries of the Arkhangelsk Oblast in the context of digitalization and automation of production. As part of the sociological research, the team conducted a questionnaire survey and semi-structured interviews among representatives of enterprises in these industries. The results of the research allowed drawing conclusions that the professional competencies of employees, as well as abilities to work independently, in non-standard situations and under stress are currently the most in-demand for employers. There is also a very high demand for qualities associated with discipline and the desire to develop in the profession. In terms of the size of enterprises, the higher requirement for almost all competences in small and medium-sized enterprises compared to large employers is noteworthy. The authors conclude that about half of the enterprises in the shipbuilding, forestry and fishing industries of the Arkhangelsk Oblast have implemented automation and digitalization into all key production processes. In the near future, more than 50% of employers expect a high demand for employee competencies related to the use of new production technologies. The survey revealed a gap between employers' expectations and the actual level of professional training and skills of recent graduates of educational institutions of higher and secondary vocational education, including with regard to the most in-demand knowledge, skills and abilities. In the context of industries, it is noteworthy that the level of satisfaction with the training of graduates of shipbuilding industry is much lower, except for those who received education through the "Plant-University" system (Severodvinsk).
**Keywords:** *staffing, competences, Arctic zone of the Russian Federation, digitalization, automation, Arkhangelsk Oblast*

### Introduction

Bringing the system of vocational and professional education into line with the projected staffing needs of employers in the economy and social sphere of the Arctic zone of the Russian Federation (hereinafter referred to as AZRF) is one of the important tasks of the Strategy for the development of the Arctic Zone of Russia and ensuring national security for the period until 2035 [1]. Research conducted by scientists from Petrozavodsk State University show the insufficiency of internal labor resources of the Arctic territories to meet the future staffing needs [1, Gurtov V.A., Pitukhin E.A., pp. 130–161]. The expected staffing needs of the Russian Arctic by 2024 in the amount of 66 thousand people can be met by a little more than 50% at the expense of graduates of Russian educational organizations, retraining of unemployed citizens and vocational training of people without education [1, pp. 130–161].

However, this task provides not only quantitative, i.e. training and retraining of the required number of specialists for industries, but also a qualitative dimension: ensuring compliance between the qualifications of employees and the requirements of employers, taking into account rapidly changing external conditions.

The problem of staffing in the Russian Arctic is actualized by complex changes in labor markets, which are determined by the specifics of the economic development of the region (dependence of mining projects on world prices for resources), the influence of sanctions from Western countries in 2022–2023 (restrictions on export of goods produced in the region, increased demand for import substitution), as well as the widespread introduction of automation and digitalization in production processes and the growing demand for supra-professional (universal, flexible, soft) competencies. The specificity of the Russian Arctic is in the heterogeneous development of the AZRF regions in terms of economic specialization and regional educational systems; therefore, it is important to conduct research on staffing in regional and industry contexts.

The satisfaction of enterprises with the level of graduates' training is an important marker for both the labor market and educational organizations. Changing requirements to employee competencies create a demand for improving existing and creating new educational programs. Thus, regular monitoring of competencies demanded by employers and compliance of graduates of educational organizations of higher education (HE) and secondary vocational education (SVE) with these requirements are necessary for the formation of a sustainable personnel policy in the region.

### State of research of the issue

A large number of scientific publications are devoted to the study of the demand for competencies. Works on this topic reveal approaches to the definition and classification of supra-professional skills [2, Marin-Zapata S.I., Román-Calderón J.P.; 3, Parlamis J., Monnot M.J., pp. 225–

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[1] Ukaz «O Strategii razvitiya Arkticheskoy zony Rossiyskoy Federatsii i obespecheniya natsional'noy bezopasnosti na period do 2035 goda» [Decree "Strategy for Developing the Russian Arctic Zone and Ensuring National Security until 2035"]. URL: http://kremlin.ru/acts/news/64274 (accessed 10 September 2022).

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227], their relationship with professional competencies [4, Lyu W., Liu J.], trends towards the demand for competencies in the context of digitalization of the economy [5, Schislyaeva E.R., Saychenko O.A.] and various industries [6, Munir F., pp. 294–305].

Monitoring studies of the Higher School of Economics make a great contribution to the research of the system of competencies and employers' demand for them in Russia. The work of N.V. Bondarenko et al. revealed significant qualification deficits of both professional and universal skills (soft skills) [7]. The monitoring study by N.V. Bondarenko (2017) noted the differentiation of employers' demand for various skills among graduates of training programs for skilled workers, office workers and mid-level training programs. For the latter, the range of priority skills turned out to be more diverse and included both professional and social skills [8, Bondarenko N.V.].

The comparative analysis of high-tech sectors of the economy in 2017 revealed trends in the interaction between employers and the system of secondary vocational education, including in the qualification assessments of recent graduates. The authors note that most young specialists needed additional training to adapt to production processes. The main claims of employers were the lack of practical professional competencies and cognitive skills (in particular, decision-making and independent work skills) [9, Bondarenko N.V.].

The authors of the monograph "Young professionals for the new economy: secondary vocational education in Russia", based on the data of employers' surveys, note the necessity of formed cognitive and social skills. The demand for these skills is well expressed and addressed to all categories of workers: from management to ordinary performers [10, Dudyrev F.F., Romanova O.A., Shabalin A.I., Abankina I.V.].

In 2021, the Department of assessment and methodology of the Autonomous NGO "Russia — Land of Opportunities" conducted a study to identify supra-professional competencies demanded by leading employers in the Russian Federation. The authors compiled a competency profile of graduates and fledgling specialists that meets the requirements of employers. The list of competencies included partnership/cooperation, customer focus, self-development and others. The authors of the study note that "on a number of competencies, university representatives and students are unanimous with the opinion of employers, but there are many competencies that university representatives and students overestimate or underestimate, which creates a dangerous discrepancy for the labor market between the requirements that employers have for young specialists and the development of which non-professional skills universities and students pay attention to" [11, Stepashkina E.A., Sukhodoev A.K., Guzhelya D.Yu.].

A similar study was carried out by the Plekhanov Russian University of Economics. According to the results of a survey of more than 500 leading Russian companies, a demand for "soft" skills was identified. Based on the results of the study, the ability to work with information, resistance to stress, knowledge of a foreign language, self-organization skills and presentation and visualization skills, communication skills, leadership qualities, creative skills, knowledge of the regulatory

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framework, and data analytics skills were put at the top of the ranking of in-demand supra-professional competencies [2].

As part of the development of the national qualification system, the National Agency for the Development of Qualifications and the All-Russian Public Opinion Research Center Foundation collected data on existing and future qualifications in the Russian economy. More than 13 thousand employers were surveyed. In addition to the current list of qualifications, popular general professional competencies were identified, as well as measures taken by enterprises to train employees. Among general professional competencies, teamwork, self-education, business communication, initiative, and the use of information and communication technologies are in greatest demand [3].

A review of scientific research on this issue shows that the questions of assessing employers' demand for employee competencies, including those related to the development of digitalization and automation of production processes, as well as employers' satisfaction with the level of training of recent graduates of higher and vocational education institutions in the context of individual regions and industries of the AZRF remain poorly studied.

### *Research methodology*

In 2022, the Institute for Strategic Development of the Arctic of NArFU named after M.V. Lomonosov conducted an applied sociological research on the topic "Staffing of the shipbuilding, forestry and fishing industries of the Arkhangelsk Oblast in the context of digitalization". The purpose of the study was to analyze the perceptions of the management of the shipbuilding, forestry and fishery enterprises of the Arkhangelsk Oblast about the staffing situation, as well as strategies for meeting the personnel needs of these enterprises [12, Saburov A.A., Minchuk O.V., Tsikhonchik N.V., et al., pp. 215–216].

Within the framework of the present work, the following aspects of the study are considered:

- assessment of employers' demand for professional and general (supra-professional, universal) competencies of employees;
- analysis of employers' demand for employee competencies related to the development of digitalization and production automation processes;
- employers' satisfaction with the level of training of recent graduates of educational institutions of higher and secondary vocational education.

Primary data collection was carried out using questionnaires and in-depth interviews.

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[2] Issledovanie Plekhanovskogo universiteta: kakie spetsialisty nuzhny rabotodatelyu segodnya [Research by Plekhanov University: what specialists do employers need today]. URL: https://rg.ru/2021/06/21/issledovanie-plehanovskogo-universiteta-kakie-specialisty-nuzhny-rabotodateliu-segodnia.html (accessed 25 October 2023).
[3] Rabotodateli opredelili trebovaniya k kandidatam: top-5 vostrebovannykh kompetentsiy na rossiyskom rynke truda [Employers have determined the requirements for candidates: top 5 in-demand competencies on the Russian labor market]. URL: https://wciom.ru/analytical-reviews/analiticheskii-obzor/rabotodateli-opredelili-trebovaniya-k-kandidatam-top-5-vostrebovannykh-kompetenczij-na-rossijskom-rynke-truda (accessed 25 October 2023).

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The questionnaire survey was conducted in electronic form using LimeSurvey software. The survey was conducted from August 3 to September 6, 2022. The questionnaire included 36 questions, divided into three main blocks:

- forecasting staffing needs;
- demanded competencies and satisfaction with the level of graduates' training;
- interaction with educational organizations.

The general population of the study included enterprises of the shipbuilding, forestry and fishing industries of the Arkhangelsk Oblast, taking into account the main and additional types of economic activities in accordance with the All-Russian classifier of types of economic activities (Table 1).

*Table 1*

*Types of economic activity*

| Economic sector | Types of economic activities |
|---|---|
| Forestry industry | 02 Forestry and logging<br>16 Manufacture of wood and products of wood and cork, except furniture, manufacture of articles of straw and plaiting materials |
| Fishing industry | 03 Fisheries and fish farming<br>10.2 Processing and preserving of fish, crustaceans and molluscs |
| Shipbuilding industry | 25.99.26 Production of ship propellers and paddle wheels<br>30.1 Construction of ships, vessels and boats<br>33.15 Repair and maintenance of ships and boats |

The general population of the survey comprised 90 legal entities of various organizational and legal forms. The total number of completed questionnaires is 21, which corresponds to 50 enterprises that were surveyed. The difference in values is explained by the specifics of the employers' survey: several large organizations filled out the questionnaire for their subsidiaries and branches, which are separate legal entities.

All industries are represented in the sample population: fishing, shipbuilding, forestry. The survey covered large (46%), as well as medium and small (54%, hereinafter referred to as SMEs) industrial enterprises. The distribution of the surveyed enterprises by industry is shown in Fig. 1.
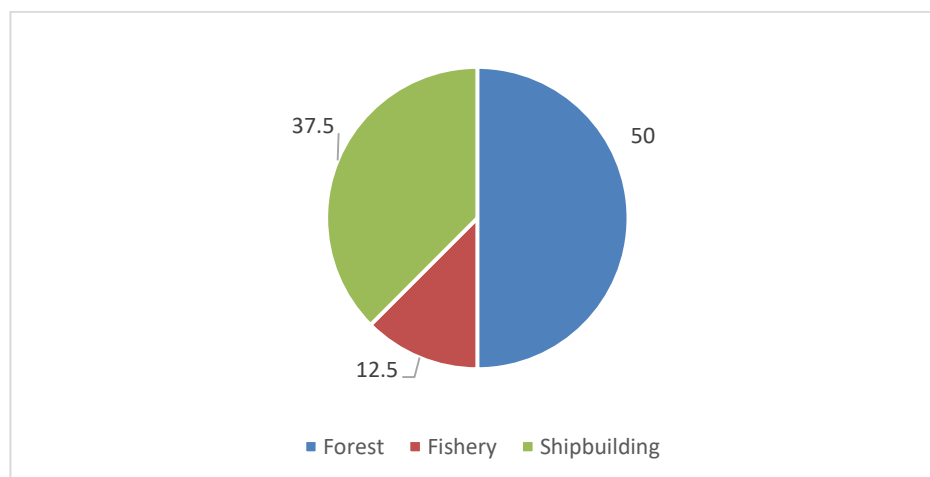


Fig. 1. Distribution of surveyed enterprises by industry, %.

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The survey was completed (from the general population of legal entities of each of the industries under consideration) as follows: the fishing industry — 40% of enterprises; the forestry — 64% of enterprises; the shipbuilding — 44% of enterprises. In the forestry industry, 36 enterprises were surveyed, employing more than 54% of the employees of the entire industry. In the fishing industry, 10 enterprises were surveyed, employing more than 54% of the employees of the entire industry. In the shipbuilding industry, 4 enterprises were surveyed, employing 93% of the employees of the entire industry.

Thus, it can be stated that the survey data meets the criterion of representativeness and can be used to assess each of the industries under consideration [4].

From November 2022 to July 2023, a survey of enterprises from the selected sample was conducted using a semi-structured interview method. 24 representatives of employers and educational institutions were interviewed. The informants were mainly managers, deputy managers for personnel issues and heads of personnel services and other structural divisions of enterprises, as well as experts from the education sector.

The interview guide included 3 sets of questions. The first block of questions concerned the problems of staffing of enterprises. The second block was aimed at identifying the attitude of informants to the level of training of graduates of educational organizations. The third block of questions was devoted to the processes of interaction between employers and educational organizations.

### *Competencies demanded by employers*

Among the most important competencies of employees of production departments, employers identified the following as priorities [5] (Table 2):

- compliance with labor discipline: work schedule, fulfilling instructions from management, etc. (average score for the sample — 4.7 out of 5);
- basic theoretical knowledge (fundamentals) in the specialty (4.4 points);
- knowledge and practical skills of working with professional devices/equipment/working methods (4.3 points);
- ability to work independently (4.1 points);
- ability to solve non-standard problems that arise during work, search for non-standard solutions and approaches (4.0 points);
- resistance to stress (4.0 points).

The survey results show a moderately high demand of employers in the shipbuilding, forestry and fishing industries for supra-professional competencies related to communication, self-

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[4] Data on the average number of employees at enterprises was obtained from the following sources: the results of a survey of employers as part of a study of the personnel needs of employers operating in the territories included in the Arctic zone of Russia "Personnel for the Arctic" and data from the B2B.House service (https://b2b. house/).
[5] These competencies are rated 4.0 points or higher on a 5-point scale, where 1 is not important, and 5 is critically important.

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organization, the ability to analyze information, and general legal literacy. The least demanded competencies with an average score below 3.0, according to surveyed enterprise representatives, are:

- understanding of the main trends in the development of the industry, knowledge of forecasts and directions of scientific and technological progress in the industry (average score 2.8);
- knowledge of a foreign language (average score 1.6).

*Table 2*

*Employers' assessment of the importance of general and professional competencies for getting a job in a company on a scale from 1 to 5 points (1 − not important, 5 − critically important) by enterprise size*

| Competencies | Entire sample | Small and medium enterprises | Large enterprises |
|---|---|---|---|
| Compliance with labor discipline (work schedule, fulfilling instructions from management, etc.) | 4.7 | 4.7 | 4.6 |
| Basic theoretical knowledge (fundamentals) in the specialty | 4.4 | 4.4 | 4.3 |
| Knowledge and practical skills of working with professional devices/equipment/working methods | 4.3 | 4.6 | 4.1 |
| Ability to work independently | 4.1 | 4.3 | 3.9 |
| Ability to solve non-standard problems that arise during work, search for non-standard solutions and approaches | 4.0 | 4.3 | 3.6 |
| Stress resistance | 4.0 | 4.4 | 3.6 |
| General computer skills (including basic office programs) | 3.9 | 4.4 | 3.4 |
| Ability to interact/cooperate with other people, communication culture | 3.8 | 3.7 | 3.8 |
| Skills in planning, organizing, managing and evaluating work | 3.7 | 3.8 | 3.5 |
| Critical thinking, ability to analyze information | 3.5 | 3.8 | 3.3 |
| General legal literacy, incl. in matters of labor relations | 3.5 | 4.0 | 3.1 |
| Professional and social activity in the workforce and professional communities | 3.4 | 3.6 | 3.2 |
| Commitment to corporate values | 3.4 | 3.4 | 3.4 |
| Advanced IT skills (including use of professional software) | 3.0 | 3.2 | 2.9 |
| Understanding of the main trends in the development of the industry, knowledge of forecasts and directions of scientific and technological progress in the industry | 2.8 | 3.1 | 2.5 |
| Knowledge of foreign language | 1.6 | 1.7 | 1.5 |

In terms of enterprise size, small and medium-sized enterprises have a higher demand for almost all the listed competences compared to large employers. The average score of importance of each competence for SMEs is 3.8 points, for large enterprises — 3.4 points. In particular, it is worth noting the significantly higher demand for the ability of SME employees to work under stress and to search for new, non-standard approaches to solving problems. This is probably a

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consequence of the wider functionality of SME employees and their lower substitutability in production processes.

In the sectoral context, no significant differences in the demand for professional and general professional competences of employees between shipbuilding, forestry and fishing industries were revealed in the course of the research (Table 3).

*Table 3*

*Employers' assessment of the importance of general and professional competencies for getting a job in a company on a scale from 1 to 5 points (1 − not at all important, 5 − critically important) by industry*

| Competencies | Entire sample | Shipbuilding industry | Forestry industry | Fishing industry |
|---|---|---|---|---|
| Compliance with labor discipline (work schedule, fulfilling instructions from management, etc.) | 4.7 | 4.8 | 4.6 | 5.0 |
| Basic theoretical knowledge (fundamentals) in the specialty | 4.4 | 4.8 | 4.2 | 5.0 |
| Knowledge and practical skills of working with professional devices/equipment/working methods | 4.3 | 4.3 | 4.3 | 4.5 |
| Ability to work independently | 4.1 | 4.0 | 4.1 | 4.5 |
| Ability to solve non-standard problems that arise during work, search for non-standard solutions and approaches | 4.0 | 4.3 | 3.9 | 4.0 |
| Stress resistance | 4.0 | 4.3 | 3.9 | 4.0 |
| General computer skills (including basic office programs) | 3.9 | 3.5 | 3.9 | 4.5 |
| Ability to interact/cooperate with other people, communication culture | 3.8 | 3.8 | 3.9 | 3.0 |
| Skills in planning, organizing, managing and evaluating work | 3.7 | 3.8 | 3.6 | 4.0 |
| Critical thinking, ability to analyze information | 3.5 | 3.8 | 3.5 | 3.5 |
| General legal literacy, incl. in matters of labor relations | 3.5 | 3.3 | 3.7 | 3.0 |
| Professional and social activity in the workforce and professional communities | 3.4 | 3.5 | 3.3 | 4.0 |
| Commitment to corporate values | 3.4 | 2.8 | 3.5 | 4.0 |
| Advanced IT skills (including use of professional software) | 3.0 | 2.5 | 3.1 | 3.5 |
| Understanding of the main trends in the development of the industry, knowledge of forecasts and directions of scientific and technological progress in the industry | 2.8 | 2.8 | 2.8 | 3.0 |
| Knowledge of foreign language | 1.6 | 2.0 | 1.5 | 1.5 |

The informants particularly highlighted the ability to work in a team as an important supra-professional competence. At the same time, not all representatives noted the importance of "soft skills": *"If he is a harvester operator, then, of course, he needs professional skills. If he doesn't know how to do it, this planning and leadership won't help him. Therefore, probably, working spe-*

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*cialties are professional competencies, of course. If they are line managers who have to manage a team, and this is especially true on a foreman's shift, at a logging site, group isolation for 15 days, they are there with each other, and, of course, management skills, communication skills are very important. Maybe even more important than professional skills"* (informant No. 12, large enterprise, forestry industry).

Among the options not proposed in the questionnaire, employers often noted during interviews that one of the key qualities of an employee is the desire to learn and develop in the profession:

*"Whoever has a desire to retrain is probably the best employee. … We found a ship electrician, he actually worked as a sales representative, and he came and said: "Look, I'm an electrician and I'm good at it and I'd really like to be a ship electrician, it's more interesting to me." We assigned him to ship electricians, and he really showed good results"* (informant No. 2, medium-sized enterprise, shipbuilding industry);

*"If the eyes don't shine, then retraining is pointless. I am convinced that a person with interest and passion is the best investment for an employer"* (informant No. 23, medium-sized enterprise, fishing industry);

*"People come who have completed a bachelor's degree, for example, in a field of pedagogy, and then completed a master's degree in forestry, and I'm immediately told not to ask him anything about taxation, he doesn't know anything anyway. …. Well, he comes, we teach him. The main thing is determination, desire to work and such a big task as stress resistance. Ability and desire to learn... It is clear that you cannot learn everything, but there is a base, and if you are ready, we are always ready to teach you the details"* (informant No. 19, medium-sized enterprise, forestry industry);

*"We teach people everything that is required on the spot, because we really use a lot of modern equipment... We value an initiative employee... who wants to understand all these innovations"* (informant No. 16, medium-sized enterprise, fishing industry).

### *Automation and digitalization of production and their impact on the in-demand employee competencies*

According to the survey data, 52.4% of the enterprises that took part in the research have implemented automation and digitalization (hereinafter referred to as A&D) processes in all key production processes; 23.8% of the enterprises implement A&D elements in certain production processes, 9.5% noted that A&D is practically not implemented (Fig. 2). In the non-production sphere, automation and digitalization processes have been implemented to a slightly lesser extent: 42.9% of enterprises have implemented A&D in almost all non-production processes, 33.3% — in particular processes.

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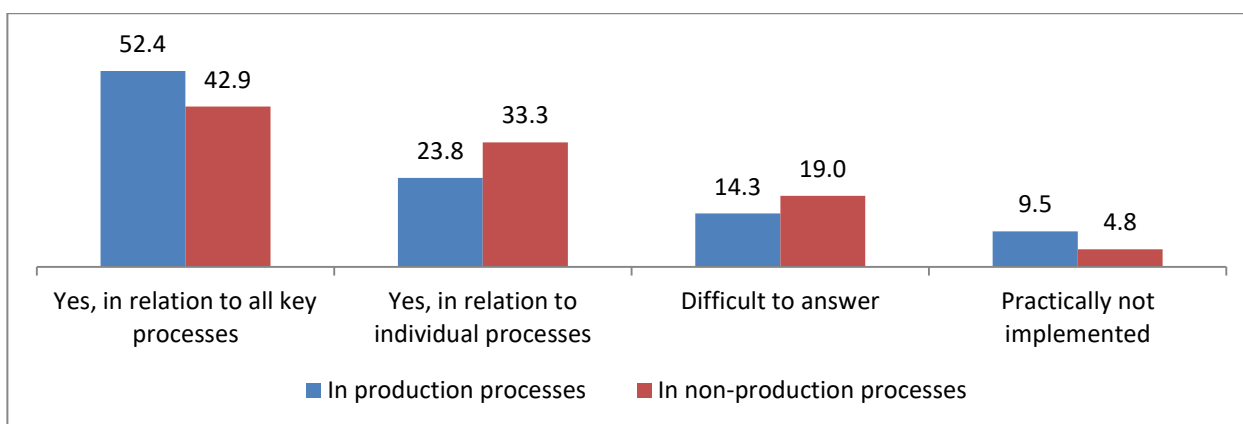
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Fig. 2. Introduction of automation and digitalization processes at enterprises in various industries based on the results of a questionnaire survey, %.

During the interviews, the massive introduction of automation and digital technologies was most often mentioned by representatives of the forestry industry, particularly in the context of the widespread use of drones, automated data collection and processing systems and GIS systems to solve production tasks:

*"The digital transformation of the forestry industry is the transition from the exchange of paper documents to the exchange of data, the introduction of registry models, and the rejection of duplicate and unnecessary information. Our company is actively involved in the production of information in digital form... In the next 5 years, competency requirements should change towards obtaining more extensive skills in working with GIS systems and working with UAVs"* (informant No. 15, medium-sized enterprise, forestry industry).

*"...now, instead of the foreman running round the forest, we use quadcopters... Then new programs for wood accounting, related to legal requirements... There are sensors on all vehicles: you can see where it went, how long it was on the road, what the efficiency is. All this is collected by the control office into reports, the reports are analyzed monthly, and the heads of separate departments can see, they can even look at it in real time, compare the plan with the fact"* (informant No. 12, large enterprise, forestry industry).

*"... in terms of forest fire detection, we are increasingly developing such a system as video detection from permanent video surveillance cameras that are located on the towers of mobile providers. There is fairly advanced software in terms of automatic detection... Unmanned aerial vehicles (quadrocopters) are already being actively used in the survey of existing forest fires to determine firefighting tactics and techniques... Ideally, the existing trend of digitalization of forestry in the future should track a plantation from its birth to its maturation, its cutting, then its boarding and practically almost a wood product"* (informant No. 19, medium-sized enterprise, forestry industry).

*"If we talk about forests, for example, construction, the same unmanned systems are no longer the future, but a necessity today, and we can't go anywhere without it. This is filming of forest plantations, floorings, construction, when the survey is carried out from a copter"* (informant No. 24, representative of the regional executive authority).

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Employers of shipbuilding and fishing industry in the interviews more often mentioned A&D of individual production processes (automation of plasma cutting, digitalization of technical documentation). At the same time, one of the respondents expressed the opinion that automation and digitalization in the shipbuilding industry is limited: *"Enterprises in the shipbuilding industry — little has changed there. We recently worked with them on a request for robotics — they say that today we do not need any such specialists..."* (informant No. 24, representative of a regional executive authority). A representative of a medium-sized enterprise in the fishing industry noted that when it comes to cutting fish fillets, manual labor remains a priority due to its higher accuracy and cost-effectiveness compared to an automated machine.

Among the most in-demand competencies that enterprise employees will have to possess in the near future, the following was mentioned: new production technologies (52.4%), system administration (33.3%), big data (33.3%), cybersecurity and data protection (28.6%), strengthening the capabilities of electronics and radio engineering (28.6%), programming and creation of IT products (19%). Other digital and end-to-end technologies seem less in demand to respondents, and a quarter of respondents found it difficult to answer this question (Fig. 3).
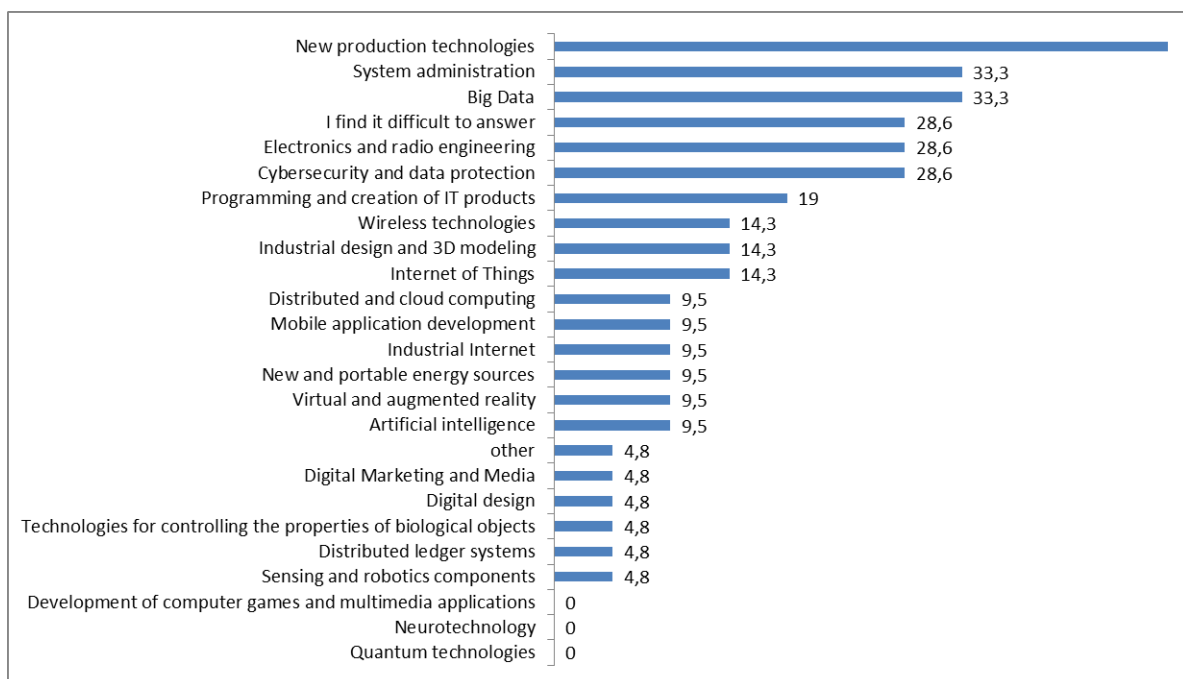


Fig. 3. In-demand employee competencies expected in the near future by employers related to automation and digitalization, %.

## Employers' satisfaction with the training level of graduates of secondary vocational and higher education

The overall level of employers' satisfaction with the competencies of recent graduates is at an average level: the average score for the sample is 3.2 on a 5-point scale (Table 4). The highest score (3.7) was given to the following competences: (1) ability to interact/collaborate with other people, communication culture; (2) general computer skills (including basic office programs) and (3) adherence to work discipline (work schedule, carrying out instructions from management, etc.).

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If we consider 3 points as the minimum level at which the employer is satisfied with the quality of the graduate's training, then the most demanded competencies presented above meet this requirement.

- Compliance with labor discipline: work schedule, fulfilling instructions from management, etc. (average score — 3.7 out of 5);
- Basic theoretical knowledge (fundamentals) in the specialty (3.5 points);
- Knowledge and practical skills of working with professional devices/equipment/working methods (3.3 points);
- Ability to work independently (3.1 points);
- Ability to solve non-standard problems that arise during work, search for non-standard solutions and approaches (3.0 points);
- Stress resistance (3.0 points).

In terms of enterprise size, the survey showed a difference between SMEs and large enterprises: the latter are less satisfied with the training of graduates (the average value is 3.5 and 2.9 points, respectively). Skills of independent work and working with non-standard problems and approaches were rated relatively low by large employers — 2.7 points each.

*Table 4*

*Employers' satisfaction with the level of training of employees working in production departments and recent graduates of educational organizations on a scale from 1 to 5 points, where 1 is completely dissatisfied, 5 is completely satisfied, by enterprise size*

| Competencies | Entire sample | Small and medium-sized enterprises | Large enterprises |
|---|---|---|---|
| Ability to interact/cooperate with other people, communication culture | 3.7 | 4.0 | 3.4 |
| General computer skills (including basic office programs) | 3.7 | 3.9 | 3.5 |
| Compliance with labor discipline (work schedule, fulfilling instructions from management, etc.) | 3.7 | 3.7 | 3.6 |
| Basic theoretical knowledge (fundamentals) in the specialty | 3.5 | 3.8 | 3.2 |
| Knowledge and practical skills of working with professional devices/equipment/working methods | 3.3 | 3.6 | 3.1 |
| Professional and social activity in the workforce and professional communities | 3.3 | 3.8 | 2.9 |
| Advanced IT skills (including use of professional software) | 3.1 | 3.8 | 2.5 |
| Ability to work independently | 3.1 | 3.5 | 2.7 |
| Commitment to corporate values | 3.1 | 3.4 | 2.9 |
| Understanding of the main trends in the development of the industry, knowledge of forecasts and directions of scientific and technological progress in the industry | 3.0 | 3.5 | 2.5 |
| Ability to solve non-standard problems that arise | 3.0 | 3.3 | 2.7 |

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| | | | |
|---|---|---|---|
| during work, search for non-standard solutions and approaches | | | |
| Critical thinking, ability to analyze information | 3.0 | 3.1 | 2.8 |
| Stress resistance | 3.0 | 3.2 | 2.9 |
| General legal literacy, including in matters of labor relations | 3.0 | 3.2 | 2.8 |
| Skills in planning, organizing, managing and evaluating work | 2.9 | 3.0 | 2.7 |
| Knowledge of foreign language | 2.5 | 2.4 | 2.5 |
| *Average value* | *3.2* | *3.5* | *2.9* |

In terms of industries (Table 5), it is noteworthy that employers of the shipbuilding industry have a much lower level of satisfaction with the training of graduates (average satisfaction score of 2.3 versus 3.2 points on average for the sample). Shipbuilders rated above 3 points only such qualities as the ability to interact/cooperate with other people, communication culture; general computer skills. Compliance with labor discipline and basic theoretical knowledge (fundamentals) in the specialty were assessed at 2.8 points.

In general, the assessment data in the questionnaire correspond to the data obtained from the interview:

*"If I say I'm happy, then everyone will throw rotten tomatoes at me... there is a minimum sufficient level, yes, it corresponds, but there is certainly a desire to have better training"* (informant No. 9, large enterprise, shipbuilding industry);

*"I am not satisfied, because what is taught at the university in theory does not match with practice at workplaces... The basic lack of competencies lies in the fact that they cannot apply basic knowledge, skills and abilities in production"* (informant No. 20, large enterprise, shipbuilding industry);

*"I can say this unofficial, but probably true, real version — we are very dissatisfied. They think that guys come with very low skills... we are not talking about higher educational, but about secondary educational institutions. And they say that if someone knows how to do something, it is thanks to either some talents, or their own interest, or the parents have invested something in them. The general opinion is that they actually are very inexperienced, they don't understand what's going on here, they don't even know any basics"* (informant No. 22, expert, shipbuilding industry).

Good reviews about the quality of training of students are associated with the "Plant−University" system, which provides engineering and technical education for specialists at shipbuilding and ship repair enterprises in Severodvinsk. Students under the "Plant−University" system are full-time students, but are employed by these enterprises from the first semester. *"If this is a graduate of Sevmashvtuz, then this is ... a one hundred percent ready specialist in all char-*

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acteristics. Why? Because we do the practice ourselves. Studying — about three semesters they work at our plant... The level of training of our technical schools, of course, leaves much to be desired... They receive a diploma, but, as they say, as in the film "Interns": "Forget everything you have been taught for 6 years, let's start all over again." (informant No. 10, large enterprise, shipbuilding industry).

*Table 5*

*Employers' satisfaction with the level of training of employees working in production departments and recent graduates of educational organizations on a scale from 1 to 5 points, where 1 is completely dissatisfied, 5 is completely satisfied, by industry context*

| Competencies | Entire sample | Shipbuilding industry | Forestry industry | Fishing industry |
|---|---|---|---|---|
| Ability to interact/cooperate with other people, communication culture | 3.7 | 3.0 | 3.9 | 3.5 |
| General computer skills (including basic office programs) | 3.7 | 3.3 | 3.8 | 3.5 |
| Compliance with labor discipline (work schedule, fulfilling instructions from management, etc.) | 3.7 | 2.8 | 3.9 | 4.0 |
| Basic theoretical knowledge (fundamentals) in the specialty | 3.5 | 2.8 | 3.7 | 3.0 |
| Knowledge and practical skills in working with professional devices/equipment/working methods | 3.3 | 2.3 | 3.7 | 3.0 |
| Professional and social activity in the workforce and professional communities | 3.3 | 2.3 | 3.7 | 3.0 |
| Advanced IT skills (including use of professional software) | 3.1 | 2.0 | 3.6 | 2.0 |
| Ability to work independently | 3.1 | 2.3 | 3.3 | 3.5 |
| Commitment to corporate values | 3.1 | 2.0 | 3.4 | 3.5 |
| Understanding of the main trends in the development of the industry, knowledge of forecasts and directions of scientific and technological progress in the industry | 3.0 | 2.0 | 3.3 | 2.0 |
| Ability to solve non-standard problems that arise during work, search for non-standard solutions and approaches | 3.0 | 2.0 | 3.3 | 3.0 |
| Critical thinking, ability to analyze information | 3.0 | 2.0 | 3.3 | 2.5 |
| Stress resistance | 3.0 | 1.8 | 3.4 | 3.0 |
| General legal literacy, including in matters of labor relations | 3.0 | 2.0 | 3.3 | 3.0 |
| Skills in planning, organizing, managing and evaluating work | 2.9 | 2.0 | 3.2 | 2.5 |
| Knowledge of foreign language | 2.5 | 1.8 | 2.7 | 2.0 |
| *Average value* | *3.2* | *2.3* | *3.5* | *2.9* |

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Informants — representatives of enterprises in the forestry and fishing industries — more often noted the low or minimally sufficient level of training of recent graduates:

*"In general, to be honest, we are not satisfied with those who came. Because, firstly, few of them came, and those who came are, probably... people who most often go there by a leftover principle. That is, "I didn't get anywhere, so I'll go there to study as a forest engineer..." That is, their motivation is most often low, they don't really understand what's going on there and what's expected of them, and their competencies, to be honest, ... not to say that everything is bad, but it's not enough"* (informant No. 12, large enterprise, forestry industry);

*"On a five-point scale, 3.5–4 with a minus. You can do nothing with it. Most of them come only with theoretical training"* (informant No. 13, medium-sized enterprise, fishing industry);

*"There are personnel, but they are incompetent, there is no one to choose from. Technologists come, but after the interview you understand that they are not ready to work"* (informant No. 23, medium-sized enterprise, fishing industry).

Of particular note is the fact that several employer representatives noted high salary expectations along with low readiness for hard physical work as a significant characteristic of recent graduates:

*"Over the past two decades, a situation has developed that the goal of most qualified students is to obtain a high level of income in a fairly short period of time and with a low workload. So, the forestry industry, which in its practical activities is not only difficult but also dangerous, with the average income of a qualified engineer with experience, becomes unattractive"* (informant No. 15, medium-sized enterprise, forestry industry);

*"I explain to all young specialists that we are ready to train you, why do you only demand a higher salary? They all want more, without experience, they want us to pay them a lot right now"* (informant No. 2, medium-sized enterprise, shipbuilding industry);

*"The opportunity to see prospects in work and try to work as long as possible, rather than chasing money at once. When finding a job, everyone dreams of receiving a high salary, which is unrealistic at the initial stage"* (informant No. 20, medium-sized enterprise, shipbuilding industry — answer to the question about recommendations that the informant could give to educational organizations);

*"Boys need to go into the forest, but they don't want to go to the forest... so the specialty is either for money in oil and gas, or, unfortunately, the aspiration to become an economist, lawyer is not outdated"* (informant No. 19, medium-sized enterprise, forestry industry).

As in the case of the shipbuilding industry, employers noted that the quality of training of students depends on the educational organization and, in particular, mentioned a higher level of graduates with secondary vocational education:

*"The guys working for us from (college name) come well. By the way, with a quality education. They come there, as a rule, from villages. Those who want and are ready to work in the forest"* (informant No. 19, medium-sized enterprise, forestry industry);

*"The level of training of students from SVE at the moment is often higher than students from HEO (note: Higher Education Organizations), which is associated with a more in-depth study of professional activities by college students than by university students"* (informant No. 15, medium-sized enterprise, forestry industry).

Identification of factors determining the quality of students' training was not the purpose of this study, however, in interviews, some informants raised this issue and associated the insufficient level of competencies with low volumes of practical training, poor development of the material and technical base of educational institutions and the low level of qualifications of teaching staff.

*"... out of a group of students, only 10% of them get to practice on a fishing vessel. The rest go to other fleets, transport, tanker fleets, somewhere else"* (informant No. 13, medium-sized enterprise, fishing industry);

*"This is the lack of qualified teaching staff. Qualified specialists don't come to them for such a salary, and young people don't come. And the material and technical base is very low... I can give a simple example: they teach CNC machine operators for us, but they don't even have a CNC machine. They ask for the exam to be held at our base..."* (informant No. 10, large enterprise, shipbuilding industry).

## *Conclusion*

The conducted research allows us to draw a number of conclusions regarding employers' perceptions of the competencies of employees in the shipbuilding, fishing and forestry industries of the Arkhangelsk Oblast.

1. The most demanded for employers are professional competences of employees (knowledge and practical skills of working with equipment and methods, basic knowledge of the specialty), as well as supra-professional competencies associated with the ability to work independently, in non-standard situations and under stress. There is also a very high demand for qualities associated with discipline and the desire to develop in the profession. The demand for employee training and adaptability is likely due to changes in the content of work activity due to the development of automation and digitalization of production, the insufficient level of training of graduates by educational organizations, as well as rapid changes in the labor market.

2. In terms of enterprise size, attention is drawn to the higher demand for almost all competencies among small and medium-sized enterprises in comparison with large employers. This is likely a consequence of, on average, the wider functionality of SME workers and their lower substitutability in production processes.

3. About half of the enterprises in the shipbuilding, forestry and fishing industries of the Arkhangelsk Oblast have introduced automation and digitalization into all key production processes. In the near future, about half of employers expect high demand for employee competencies related to the use of new production technologies. A&D are most widely used in the forestry in-

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dustry: unmanned aerial vehicles, automated data collection and processing systems, and geographic information systems are widely used to solve production problems.

4. In general, the study allows us to record the existence of a gap between employers' expectations and the actual level of professional training and supra-professional competencies of recent graduates of higher and secondary vocational education, including in relation to the most in-demand knowledge, skills and abilities. In terms of industries, it is noteworthy that employers of the shipbuilding industry, except for the graduates educated under the "Plant−University" system (Severodvinsk), have a much lower level of satisfaction with the training of graduates.

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