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SKILLS AND ATTITUDES GAP IN THE PROCESS OF SHAPING KEY COMPETENCIES IN ENTERPRISES IN THE HIGH-TECH SECTOR – RESEARCH RESULTS[1]

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Purpose: The article undertakes an attempt to answer the following questions: What key competencies, skills and attitudes should characterize high-tech sector management personnel? Is there a skills gap and an attitudes gap, that is discrepancies between the desired and the actual skills and attitudes of high-tech managers?; What action can contribute to minimizing the identified skills and attitudes gap?
Design/methodology/approach: To answer the research questions, it was necessary to carry out a review of the subject literature and to conduct the study. This included 504 managers from all levels of management in high-tech enterprises operating in Poland. The data obtained in the study was subject to statistical analysis, on the basis of which conclusions were formulated.
Findings: The greatest gap covers skills making up such key competencies as: efficient management of R&D activity and high level of employee independence. The greatest gap in relation to attitudes includes such key competences as: use of modern IT systems in communication processes and high level of innovativeness. The highest aggregate level of skills and attitudes gaps relates to two key competencies: efficient management of R&D activity and a high level of innovativeness.
Practical implications: The presented results is part of a wider research project aimed at identifying and assessing the levels of the key competences of managers employed in high-tech enterprises. In order to minimise the identified attitudes gap, specific actions were recommended be taken to improve these attitudes.
Originality/value: The contribution of the research procedure was identifying key skills and attitudes among tactical- and operational-level managers in high-tech enterprises, and ranking them according to the size of the discrepancy between the actual and desired state. Activities were also identified that aimed to improve managers' key skills and attitudes. Such activities can contribute to increasing the efficiency and competitiveness of high-tech enterprises.
Keywords: managers, key competences, managerial skills, managerial attitudes, high-tech enterprises.
Category of the paper: research paper.

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1. Introduction

The fourth industrial revolution is a complicated process involving the technological and organizational transformation of enterprises, and is a consequence of the development of wireless connectivity, the automation of production, nanotechnology and artificial intelligence. In such conditions, a particular role should be assigned to enterprises in the high-tech sector, as knowledge, innovation and research and development are of significant importance in the realization of their development strategies. Such enterprises are the creators of change. They play a key role in the development of the economy as they are the source of its competitiveness and modernity. Industry 4.0 also places requirements on employees, who must be open to changes and ready to perfect the necessary competencies. In view of the above - as part of the research process - action was taken that aimed to indicate gaps in key competencies by identifying skills and attitudes gaps among management personnel in high-tech enterprises. In the research process, it was assumed that competencies were understood to be the totality of knowledge, experience, skills and attitudes. Theoretical considerations led to the conclusion that the individual elements of competencies have a significant impact on their level, and that such elements are linked to one another. It was also assumed that management competencies differ depending on the sector (Tiruneh, Fayek, 2019, p. 30). As a result of the research process, a gap was identified in the skills and attitudes of management personnel, with the smallest skills gap relating to efficient use of information and communication technology systems and effective use of knowledge and the skill of decision-making, and the greatest skills gap in skilful financial management and obtaining external funding. Meanwhile, the smallest attitudes gap covered the willingness to learn new things, encouraging subordinates to develop, tenacity, the readiness to enter into relations with other people and acceptance of diversity, while the greatest gap was found with regard to the willingness to participate in continuous self-improvement and a high level of engagement. The existence of skills and attitudes gaps among management personnel contributes to the development of a competencies gap, which requires action to be taken in order for it to be minimized.

2. Key competences of managers

Observing the phenomena that occur in business practice, it can be seen that managers are expected to carry out tasks resulting from the functions they perform in the enterprise. Owing to this mechanism, managerial competences consist of sets of managers' abilities to act in managerial positions (McClelland, 1973; Boyatzis, 1982; Wynne, Stringer, 1997; Wood, Payne, 1998; Becker et al., 2002; Rankin, 2002; Whiddett, Hollyforde, 2003; Delobbe et al.,

2003; Friensen, Terry, 2004; Cheetham, Chivers, 2005; Dessler, 2009; Kuz'mina et al., 2020; Lévy-Leboyer, 2009; Sall, 2004; Rathus, 2011). Owing to the diversity of skills (Roszyk-Kowalska et al., 2022) and attitudes, the key competences of managers are formulated.

Rostkowski (2002) proposes eight categories of competences: aptitudes, skills and abilities, knowledge, physical requirements for a managerial position, styles of action, personality, principles and values (Spencer, Spencer, 1993) and interests. In turn, Filipowicz (2004) lists managerial competences associated with employee management: building an efficient organisation, building teams, coaching, delegating tasks, managing, managerial control, strategic thinking, evaluation and development of subordinates, managerial courage, organising, planning, leadership, conflict resolution, information management, novelty management, process management, project management, management by objectives and change management.

These competences concern the soft areas of management, work organisation and the strategic aspects of management. According to Filipowicz (2014), the level of these competences determines how efficiently the area of activity is subordinated to management functions.

On the other hand, Dąbek (2002, p. 145) lists the key competences of managers based on their opinions: the ability to cooperate, long-term thinking, responsiveness, flexible behaviour, negotiation skills, creative skills, realism, perseverance in action, resistance to stress, the ability to assess situations, self-presentation skills, pragmatism in action, ease of communication, effectiveness of actions, self-development, knowledge of foreign languages, high general knowledge, sociotechnical skills, a sense of responsibility, openness to the world, entrepreneurship, common sense, initiative and optimism.

On the other hand, the key competences of a manager of a contemporary organisation, Rakowska (2007, p. 200) include:

- skills: self-management (self-awareness), planning and anticipation, change management, problem solving and decision making (also creative), negotiation and conflict resolution skills, building relationships with other people, motivating employees;
- knowledge: knowledge of the latest trends and solutions in the areas of organisation and management, knowledge of the potential for using information technology;
- personality: willingness to learn new things, risk-taking, at least average self-confidence, energy, high resistance to stress, openness, at least average independence from others and flexibility.

Stabryła (2011, pp. 116-119) distinguishes certain repeatable types of managerial competences, appropriate for effective managers, enumerating the following ones: substantive competences, professional maturity, IT competences, knowledge of foreign languages, ethical competences, leadership competences, teamwork competences, coaching competences, negotiation competences, competences to motivate subordinates, communication competences,

competences to create employee involvement, business competences, strategic thinking, analytical thinking, result orientation, competences to introduce changes, innovativeness and project management competences.

On the other hand, Oleksyn (2014, p. 162) has divided the key competences of the managers of enterprises, considering their level of management. According to the author, the expected key competences of ideal top managers in enterprises are as follows:

- imagination, the ability to select and effectively shape the mission, vision and strategy of the organisation (department). If only one word was to be used to describe the most important quality of a manager at this level, it would be the word 'strategist';
- the ability to shape appropriate relationships between the company and the external environment: the most important customers, contractors and competitors; tracking the economic situation, demand, supply, changes in law and foreign policy; predicting the future in order to prepare the company well for appropriate changes;
- competences of the organisation's politician and diplomat – important in both external and internal relations;
- the ability to select the most appropriate people for key positions in the company and its individual areas;
- the ability to take a holistic approach and implement system management;
- the ability to focus on the most important issues and efficiency in action.

Oleksyn has supplemented these competences with second-order (important) and third-order (complementary) competences (Oleksyn, 2014, p. 163).

The competences of middle managers are related to cooperation with equivalent units (divisions, departments) and coordination of work within the entrusted organisational unit. Middle managers are primarily involved in shaping the strategy of organisational units entrusted to them and in preparing these units for efficient functioning in the future. In general, however, achieving medium- and short-term goals is more important than strategic management. These managers manage people, so they: select employees and build teams; inspire, motivate and integrate; evaluate employees and guide their professional development; conduct interpersonal communication; resolve conflicts; act as liaison between top managers and people in the entrusted area of operation and represent them. Important and expected competences of these managers are innovativeness and the ability to manage change. Middle managers are expected to have most of the social competences considered necessary for top managers. The ideal middle manager should be responsible, fair, balanced and composed, cultured, courageous and firm, have developed empathy, and so on (Oleksyn, 2014, pp. 175-179). Many social competences, which generally resemble the competences of middle managers, are also expected from lowest-level managers. At the operational management level, a manager must often prove themselves as a team builder and leader. Therefore, the useful elements include knowledge of a given specialty, creativity, innovativeness, openness,

cognitive curiosity, imagination and, at the same time, realism, analytical skills, insight and inquisitiveness (Oleksyn, 2014, pp. 180-187).

In conclusion, there are significant differences in the key competences of managers depending on the level of management. Strategic competences are of importance for top managers, competences of an integrator for middle managers, and substantive competences (job-related in the traditional sense) for lower managers (Wawrzyniak, 2003, pp. 333-334).

Therefore, key competences differ depending on the industry and specificity of a manager's job or the requirements that are placed on a manager in a given position (Oleksyn, 2014, p. 147). A review of theoretical and empirical studies (Roszyk-Kowalska, 2018) makes it possible to conclude that there is a gap in the area of identifying and assessing the current state of knowledge in the area of key management competences. Therefore, an attempt has been made to develop a set of key competences characteristic of managers in high-tech enterprises, assuming that they are constituted by skills, attitudes, experience and knowledge, while:

- skills indicate what a manager can do, they suggest the ability of the manager to function efficiently in an organisation;
- an attitude is a relatively stable tendency to a positive or negative approach to various objects – people, ideas and specific things, which determines behaviour in certain situations.

3. Research methodology

Within the research process, a three-stage research procedure was adopted:

Stage 1. Identify key competencies among the management of high-tech sector enterprises on the basis of the opinions of management personnel and the opinions of experts representing selected academic institutions in Poland, as well as economic practice.

Stage 2. Identify variables characterizing the key skills and attitudes among the management of high-tech sector enterprises on the basis of the opinions of management personnel and the opinions of experts.

Stage 3. Identify the skills and attitude gaps, understood as the difference between the expected status and the declared status. The expected status is determined on the basis of indications from strategy level management personnel, while the declared status is identified on the basis of the opinions of tactical and operational level management personnel from the enterprises included in the study. To assess the expected status and declared status in terms of key skills and attitudes, a 7-point Likert scale was applied.

The significance of the gaps in key skills and attitudes was determined on the basis of a U Mann-Whitney test. The null hypothesis was formulated in such a way that the distributions of the mean significance of a given key skills and attitudes indicated in the compared populations (strategic managers and tactical or operational managers) were equal. The level of significance was set at $\alpha = 0.05$.

The W test statistic was determined as follows:

$$W = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1 \quad (1)$$

$$W' = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2 \quad (2)$$

where:

n_1, n_2 – the sizes of the samples taken from population 1 and population 2, respectively;

R_1, R_2 – the sums of the ranks for the samples taken from population 1 and population 2, respectively;

The lesser value W or W' was subject to interpretation.

4. Research results

In the first stage of the research process, the set of studied key competencies was limited to the nine assigned the highest level of importance by the managers and experts.

On this basis, the key competencies of high-tech sector enterprises included:

- a high level of entrepreneurship,
- a high level of creativity,
- effective processes for obtaining, using and sharing knowledge,
- a high level of the use of teamwork potential,
- a high level of innovativeness,
- the ability to cooperate with external entities,
- a high level of employee independence,
- efficient management of R+D activity,
- the use of modern IT systems in communication processes.

In the second stage of the research process, the key competencies of high-tech enterprises identified in the first stage were transformed into sets of variables characterizing key skills and attitudes. It was assumed that the competencies will be characterized by the three skills and the three attitudes with the highest levels of significance.

The transformation of variables characterizing key competencies into a set of variables characterizing key skills and attitudes is presented in Table 1.

Table 1.
Key competencies of high-tech enterprises as variables characterizing key skills and attitudes

Key competencies	Key skills	Key attitudes
The use of modern IT systems in communication processes	effective exchange of information	willingness to participate in continuous self-development
	efficient use of information and communication technology systems	achievement-oriented
	identifying trends and changes in the development of IT technology	high level of engagement
High level of innovativeness	analytical skills	questioning stereotypes
	synthesis skills	seeking more effective solutions
	predictive thinking	openness to innovation processes
Cooperation with external entities	attention to correct relations with elements of the micro- and macroenvironment	attention to positive relations with partners
	skill of managing the enterprise in an international environment	attention to positive relations with competitors
	creating a positive image for the enterprise	achieving pro-social aims
High level of employee independence	acquiring the necessary material and non-material resources	resistance to stress
	organising one's own organisational positions	self-criticism
	learning from one's own and others' mistakes	delegating decision-making powers
Efficient management of R&D activity	obtaining external funding	awareness of one's own responsibility for the firm's development
	skilful financial management	not avoiding risk in the decision-making process
	effective use of knowledge	development-oriented
High level of the use of teamwork potential	accurate use of motivational stimuli	being consequential in achieving aims
	attention to ensuring correct relations with others	task- and success-oriented
	taking into account emotions in the team in decision-making	acceptance of diversity
High level of entrepreneurship	decision-making skills	tenacity
	continuous comparison of achieved results with adopted aims	independence in presenting one's own opinions and judgements
	taking action on the basis of prepared plans	awareness of one's own value
Effective processes for obtaining, using and sharing knowledge	analysing trends and changes in the enterprise and its environment	encouraging subordinates to develop
	recruiting employees willing to participate in continuous learning	striving to ensure the organisation's success
	creating interpersonal relations oriented towards knowledge-sharing	willingness to enter into relations with other people
High level of creativity	creating and implementing innovations	readiness to make mistakes
	use of visualisation methods and techniques	willingness to learn new things
	tolerance of errors and attempts to eliminate them	open attitude to learning about new things

Source: own elaboration (Roszyk-Kowalska, 2018).

In the third stage, action was taken to identify the skills and attitudes gaps - Figure 1 and Figure 2.

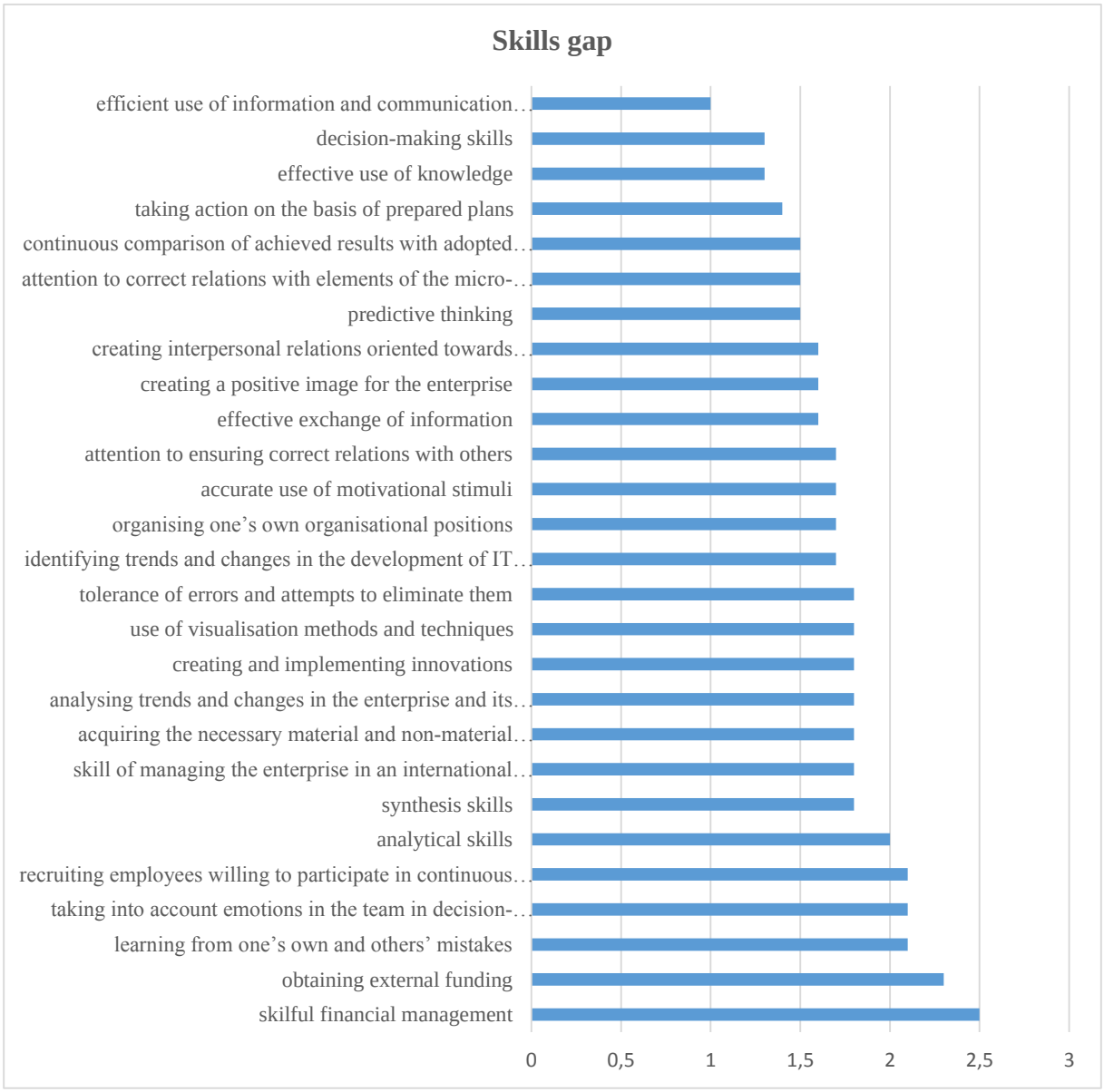

Figure 1. Skills gap among management personnel of high-tech enterprises.

Source: own elaboration.

Analysis of the research results related to identifying skills gaps enabled the following conclusions to be formulated (Figure 1):

- the smallest skills gap related to efficient use of information and communication technology systems (1.0), effective use of knowledge (1.3) and decision-making skills (1.3),
- the greatest skills gap related to skilful financial management (2.5) and obtaining external funding (2.3).

In addition, with regard to the studied key competencies it was found that for:

- use of modern IT systems in communication processes - the greatest gap was identifying trends and changes in the development of information technologies (1.7), and the smallest was the skill of using information and communication technology systems (1.0),
- high level of innovativeness - the greatest gap was in analytical skills (2.0), while the smallest related to predictive thinking (1.5),
- cooperation with external entities - the greatest gap was in skilful management of the enterprise in an international environment (1.8), while the smallest was attention to correct relations with elements of the micro- and macro environment (1.5),
- high level of employee independence - the greatest gap was in learning from one's own and others' mistakes (2.1), and the smallest related to the skill of organising one's own organisational positions (1.7),
- efficient management of R&D activity - the greatest gap was in skilful financial management (2.0), while the smallest related to the effective use of knowledge (1.3),
- high level of the use of teamwork potential - the greatest gap was in taking into account emotions in the team in decision-making (2.1), and the smallest was accurate use of motivational stimuli and attention to ensuring correct relations with others (1.7),
- high level of entrepreneurship - the greatest gap related to the skill of continuously comparing achieved results with adopted aims (1.5), and the smallest was decision-making skills (1.3),
- processes for obtaining using and sharing knowledge - the greatest gap was in the skill of recruiting employees willing to participate in continuous learning (2.1), and the smallest related to creating interpersonal relations oriented towards knowledge sharing (1.6),
- high level of creativity - skills characterizing key competencies in a high level of creativity demonstrated the same level of gap (1.8).

In reviewing the results of the research process directed towards identifying attitude gaps, the following principal conclusions can be drawn (Figure 2):

- the smallest attitudes gap relates to the willingness to learn new things (0.7), encouraging subordinates to develop (1.3), tenacity (1.3), readiness to enter into relations with other people (1.3) and acceptance of diversity (1.3),
- the greatest attitudes gap appears with regards to the willingness to participate in continuous self-development (2.1) and a high level of engagement (2.0).

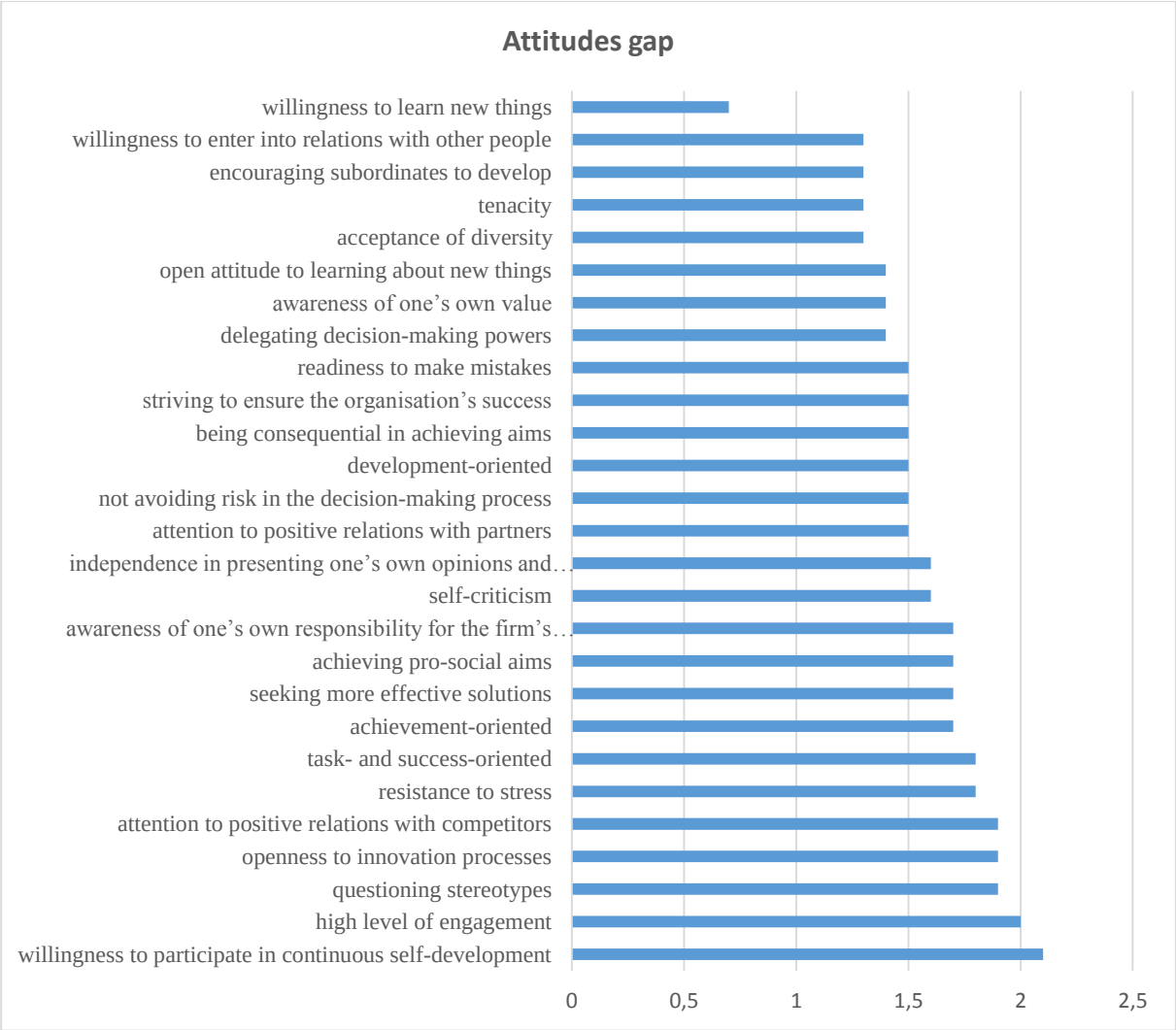

Figure 2. Attitudes gap among management personnel of high-tech enterprises.

Source: own elaboration.

With regard to the studied key competencies, it was also found that for:

- use of modern IT systems in communication processes - the greatest gap was in the willingness to participating continuous self-development (2.1), and the smallest gap was for being achievement-oriented (1.7),
- high level of innovativeness - the greatest gap was for the attitudes of questioning stereotypes and openness to the processes of innovation (1.9), while the smallest gap was for the attitude - seeking more effective solutions (1.7),
- cooperation with external entities - the greatest gap was for attention to positive relations with competitors (1.9) and the smallest was for the attitude - attention to positive relations with partners (1.5),
- high level of employee independence - the greatest gap was for resistance to stress (1.8), while the smallest gap related to the attitude regarding delegating decision-making powers (1.4),

- efficient management of R&D activity - the greatest gap was for the attitude awareness of one's own responsibility for the firm's development (1.7), meanwhile the smallest was for not avoiding risk in the decision-making process and being development-oriented (1.5),
- high level of the use of teamwork potential - the greatest gap was in the attitude of being task- and success-oriented (1.8), and the smallest gap related to the attitude acceptance of diversity (1.3),
- high level of entrepreneurship – the greatest gap occurred for the attitude – independence in presenting one's own opinions and judgements (1.6) and the smallest was for tenacity (1.3),
- effective processes for obtaining, using and sharing knowledge – the greatest gap was for striving to ensure the organisation's success (1.5), and the smallest was for the attitude encouraging subordinates to develop (1.3),
- high level of creativity - the greatest gap occurred for the attitude readiness to make mistakes (1.5), and the smallest was for the willingness to learn new things (0.7).

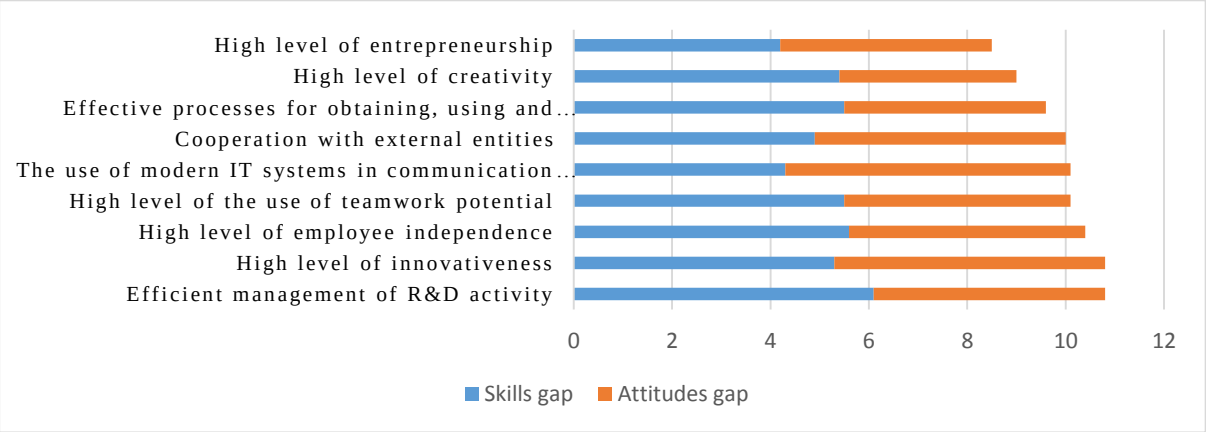

Figure 3. Skills and attitudes gap among management personnel of high-tech enterprises – aggregated data.

Source: own elaboration.

Figure 3 presents aggregated data of the research results diagnosing the level of skills and attitudes gaps relating to the studied key competencies among management personnel of high-tech enterprises. Based on the aggregated analysis, it can be seen that the greatest gap covers skills making up such key competencies as: efficient management of R&D activity (6.1) and high level of employee independence (5.6). Meanwhile, the smallest gap in skills covers the following key competencies: high level of entrepreneurship (4.2) and use of modern IT Systems in communication processes (4.3). The greatest gap in relation to attitudes includes such key competences as: use of modern IT systems in communication processes (5.8) and high level of innovativeness (5.5). Meanwhile, the smallest gap in attitudes includes the following key competencies: high level of creativity (3.6) and effective processes for obtaining, using and sharing knowledge (4.1).

The highest aggregate level of skills and attitudes gaps relates to two key competencies: efficient management of R&D activity and a high level of innovativeness (10.8). Meanwhile the lowest is for: high level of entrepreneurship (8.5) and a high level of creativity (9.0). A higher level of skills gap than attitudes gap is noted for five key competencies, that is: efficient management of R&D activity, high employee independence, high level of the use of teamwork potential, effective processes for obtaining, using and sharing knowledge, and a high level of creativity. In the case of the remaining key competencies, that is a high level of innovativeness, the use of modern IT systems in communication processes, corporation with external entities, and a high level of entrepreneurship - the attitudes gap is greater than the skills gap.

5. Summary

In high-tech enterprises, the key competencies of management personnel should be seen as a particularly important resource that contribute to an increase in the efficiency and competitiveness of such enterprises. For this reason, it is particularly important to continually improve these competences by taking action that contributes to minimizing skills and attitudes gaps. The status of gaps should be interpreted as the difference between the level of skills and attitudes desired by strategic management personnel, and the level declared by tactical and operational management personnel in the focal enterprises.

The research results show that the lowest aggregate level of gaps relate to the following key competencies: high level of creativity and high level of entrepreneurship. Due to the specifics of the activity of high-tech enterprises, the high aggregate level of skills and attitude gaps characterizing the following key competencies can be considered to be a worrying phenomenon: high level of innovativeness and efficient management of R&D activity.

In order to minimize the identified competencies gap, it is posited that action be undertaken that can contribute to shaping skills or attitudes conducive to minimizing the identified gaps. In the opinion of the authors, such action should include above all shaping such skills and attitudes that demonstrate a higher gap level within individual key competencies.

Action contributing to the minimization of such gaps may consist of shaping attitudes of openness towards the processes of creating and implementing new solutions, breaking accepted patterns of behaviour, questioning what is considered by other organization participants to be immutable, improving skills for taking effective action aimed at obtaining various forms of support for R&D activity through funding from outside the enterprise, and rational financial management.

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