



European Skills Panorama

Building an Ecosystem
for 21st Century Skills
Education in STEM

Employers from 29 countries assess the key employability skills of STEM graduates as needed in the 21st century labour market.

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Building an Ecosystem for 21st Century Skills Education in STEM (BE-21-SKILLED)

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EXECUTIVE SUMMARY



- Employers from 29 countries participated to assess the key employability skills of STEM graduates as needed in the 21st century labour market. Mainly human resource managers and executives participated in the survey.
- 21st century skills are extremely important in the labour market and are highly valued for STEM graduates. The employers particularly highly value the self-management, social, emotional, attitudinal and cognitive skills.
- Employers are unanimous about the extreme importance of self-management skills, critical thinking and problem-solving skills, as well as communication and teamwork skills. Other most highly valued skills are growth mindset and learning skill, responsibility, ability to adapt and withstand stress, creativity skills, information and data literacy skill, positive attitude and mindfulness, emotional intelligence and leadership skills.
- When it comes to the performance of universities in developing key employability skills, the skills that received the highest employer ratings in the importance assessment are relatively more difficult to acquire at the European universities. Employers are the most skeptical about universities' ability to develop emotional intelligence, positive attitudes and mindfulness, leadership, adaptability and resilience, self-management, creativity, sustainability competence, global mind-set and responsibility skills.
- The importance – performance analysis helped to identify the skill areas which require the immediate attention and highest prioritization when it comes to preparing STEM graduates for the labour market. These are:
 1. Self-management, purposefulness, perseverance
 2. Adaptability, resilience and stress resistance
 3. Creativity, curiosity, open mindset, spotting opportunities
 4. Responsibility and fairness
 5. Emotional intelligence and empathy
 6. Wellbeing, positive attitudes and mindfulness
- The employer demands in Latvia and Serbia, the project's piloting countries, are similar to the general requirements in the European labour market. However, in designing the action plan for 21st century skills development for STEM graduates, in addition to the abovementioned skills, the 'Creativity, curiosity, open mindset, spotting opportunities' should also be prioritized in Latvia, but in Serbia – 'Growth mindset and learning'.

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INTRODUCTION

The rapid change of technology, growing globalisation and internationalisation, in addition to the shift from industrial to knowledge-based economies, has accelerated the need for 21st century skills. Well-rounded 21st century skills are vital in battling an uncertain future and aiding Europe in being more resilient and responding better to looming threats. Science, technology, engineering, and mathematics (STEM) graduates are often reported to lack 21st century skills by employers, which in turn prevents them from innovating, developing, and adapting in uncertain, volatile times.

The **Be21Skilled project** argues that the introduction of 21st century skills and their integration into existing curricula has the potential impacts of firstly, creating more competent, job-ready STEM graduates, and secondly, fostering a support system and by extension increasing retention rates of at-risk female STEM students. Therefore, there is a clear need in fostering 21st century skills by upskilling both STEM teachers and students. The objectives of the project are to:

- Facilitate the understanding and identification of 21st century skills in region-specific and labour-market relevant contexts through multi-stakeholder collaborative efforts.
- Foster the HEI teachers' abilities to instil 21st century skills in their students via training and feedback loops.
- Enhance the skills among students to increase their employability and capitalise on their innovative potential.
- Improve the understanding of non-female STEM actors (students, teachers, employers, etc.) on the need to support female STEM students and instil 21st century skills in them.
- Innovate the curricula by embedding tools targeted at developing particular skills in students.

The **European Skills Panorama** details 21st century skills, which the labour market looks for in recent STEM graduates, based on Europe-wide survey, to ensure replicability. The report aims at demarcating the current state of affairs with respect to the 21st century skills needs, challenges and opportunities, as well as pinpointing the challenges in current pedagogical approaches in teaching 21st century skills. The report covers all European countries, with particular focus on Latvia and Serbia, countries in which the project results will be approbated. The European Skill Panorama will inform elaboration of the tools for teaching the STEM students in European universities and the strategies for priority action at the level of universities.

The project team:

PARTICIPANTS' PROFILES



01 | PARTICIPANTS' PROFILES

The 21st century skills European employer survey had the participation of 29 countries, including 25 EU member states and USA. Overall, 300 responses were collected (Figure 1).

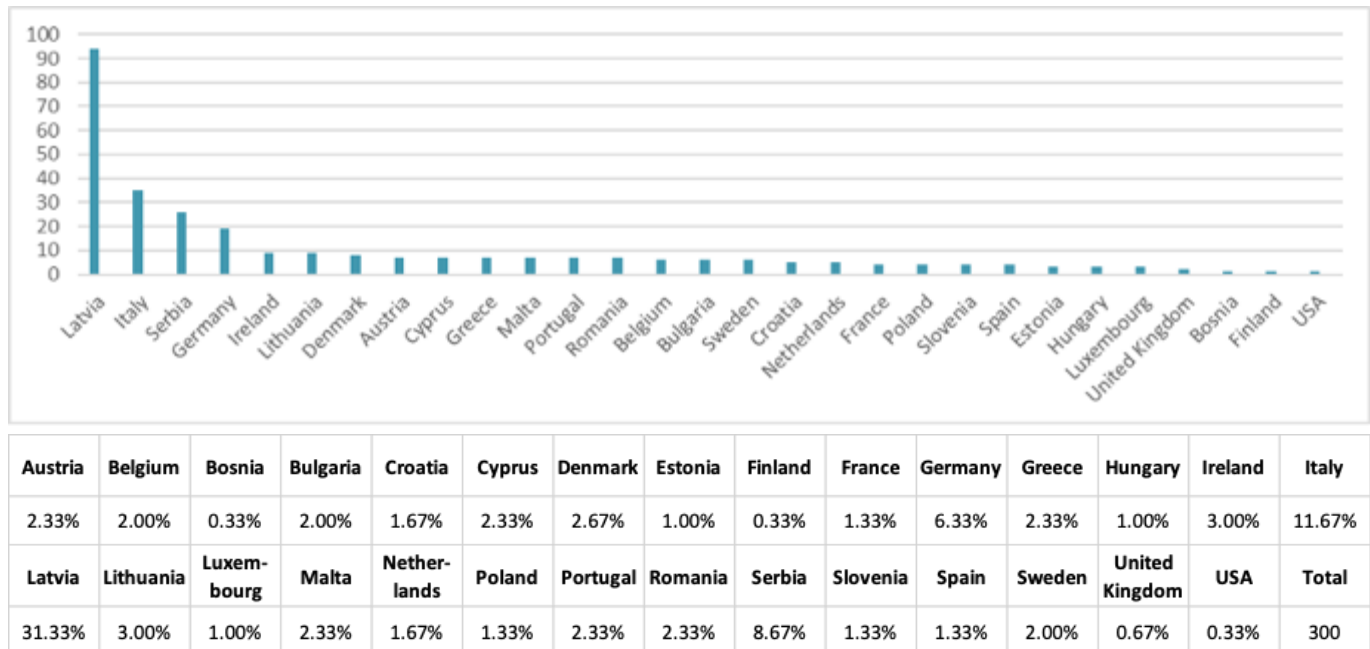


Figure 1.1. Participants by country

Source: Authors' calculations based on employer survey conducted in 2022, n=300

Almost 55% of enterprises of respondents operate in services-related sector, including transport and logistics, provision of scientific and technical services, transport and logistics. A quarter of enterprises operate in production sector, 14% - trade, and 5% - in construction sector. Almost half of all enterprises are large, employing over 250 employees, a quarter – medium-sized, and small and micro enterprises were represented by 13% of respondents each (Figure 2).

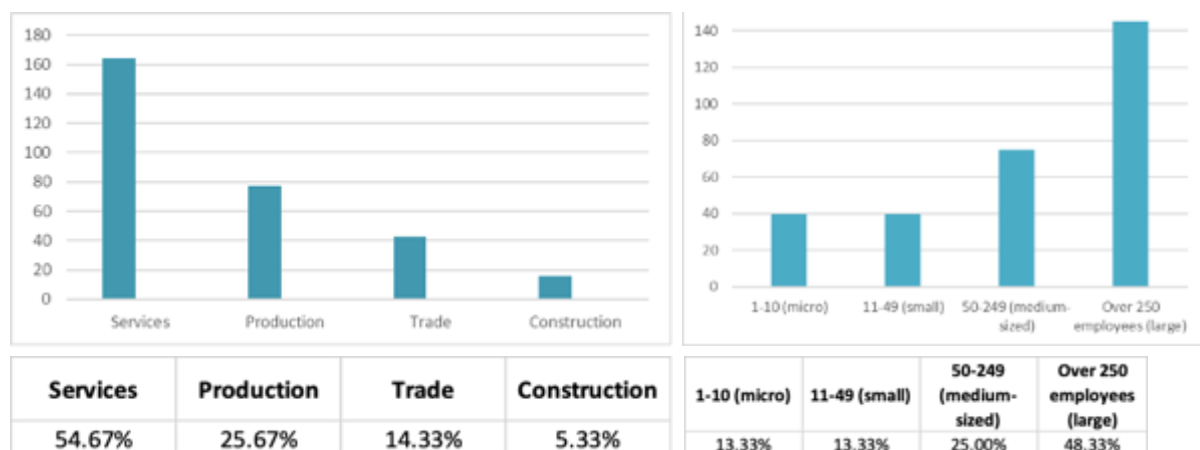


Figure 1.2. Participants by broad economic sectors and the size of the enterprise

Source: Authors' calculations based on employer survey conducted in 2022, n=300

More detailed distribution of respondent enterprises, their sectors and size, by countries is included in the annex (table 1, table 2).

Mainly executives (30%) or human resources managers (HRM) (40%) took part in the survey, less often other managers (15%), specialists, including researchers, developers and experts (12%) and some business owners or supervisors (3%) (Figure 3).



Figure 1.3. Participants by their role in enterprise

Source: Authors' calculations based on employer survey conducted in 2022, n=300

21ST CENTURY SKILLS AS REQUIRED BY EUROPEAN LABOUR MARKET





02 | 21ST CENTURY SKILLS AS REQUIRED BY EUROPEAN LABOUR MARKET

Employers' answers show that 21st century skills are extremely important in the labour market and are highly valued for STEM graduates. Employers were invited to rate the 17 key employability skills of STEM graduates as needed in the 21st century labour market, identified by authors through meta-analysis of international 21st century skills frameworks.

As can be seen from Figure 2.1 which shows the full list of evaluations, the employers are almost unanimous (99% of positive answers) about the **extreme importance** of:

- 'Self-management, purposefulness, perseverance',
- 'Critical thinking, problem-solving and systems thinking' and
- 'Communication, collaboration and teamwork'.

Other highly valued competences reaching over 80% of positive answers are:

- 'Growth mindset and learning' (97%),
- 'Responsibility and fairness' (96%),
- 'Adaptability, resilience and stress resistance' (95%),
- 'Creativity, curiosity, open mindset, spotting opportunities' (94%),
- 'Information and data literacy, information interpretation' (92%),
- 'Wellbeing, positive attitude and mindfulness' (90%),
- 'Emotional intelligence and empathy' (86%) and
- 'Vision, leadership, mobilising and managing others' (81%).

The overall tendency that can be identified is the high assessment of self-management, social, emotional, attitudinal and cognitive skills, the skills that could be associated to personality, attitudes and thinking abilities, and less to the skills that could be traditionally acquired at the educational institutions.

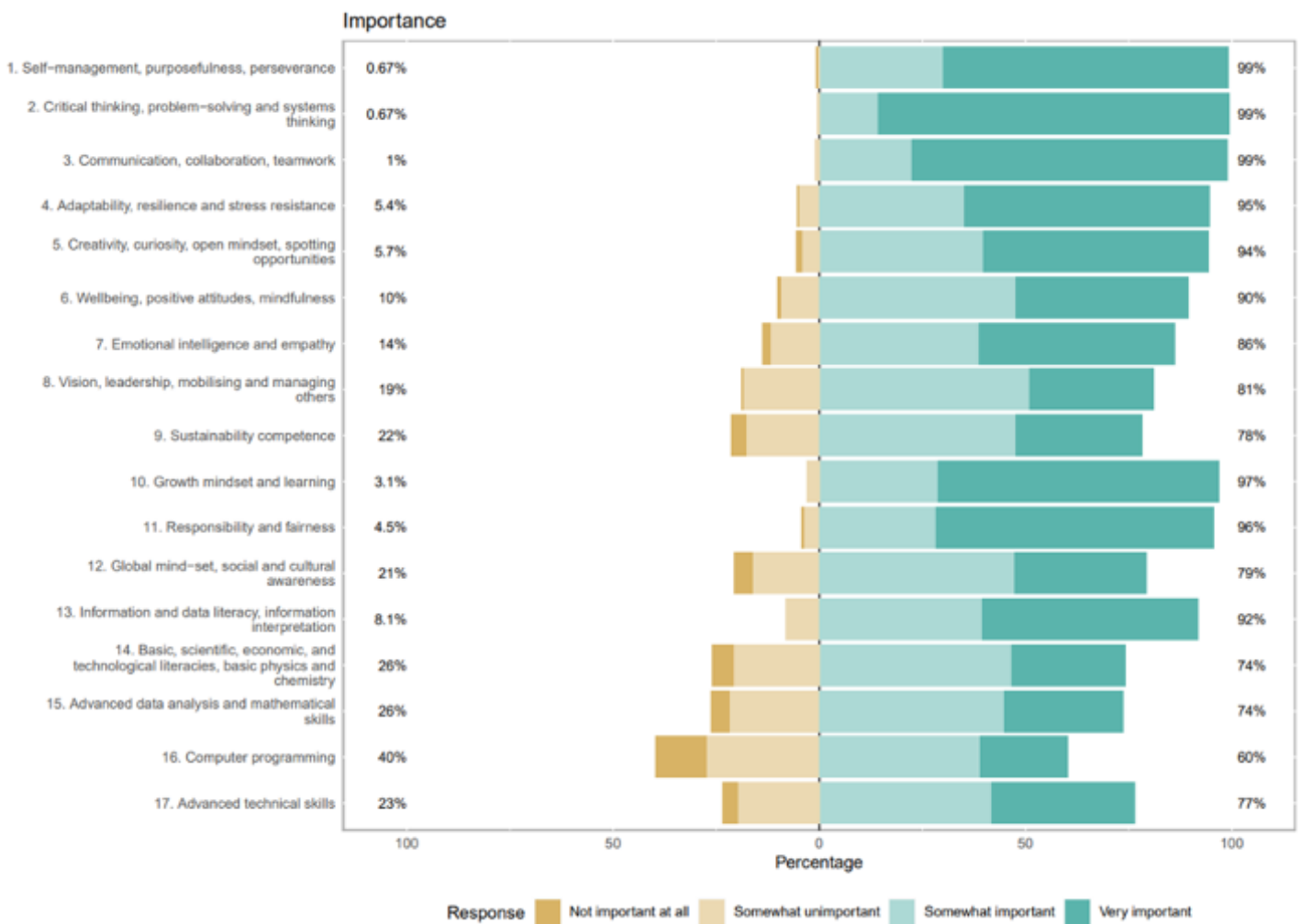


Figure 2.1. Employers’ assessment of the importance of 17 key employability skills of STEM graduates as needed in the 21st century labour market
 Source: Authors’ calculations based on employer survey conducted in 2022, n=300

Although computer programming, mathematical skills, scientific literacies and advanced technical skills were rated very highly, relatively more employers rated them as less important than self-, social and emotional skills. This may be related to the universality of these skills - they are highly valued in every organization, regardless of industry, occupation and position. But these skills are also more difficult to train in the workplace. Accordingly, employers willing to train their employees in specific technical skills may feel more

powerless with respect to those skills and may prefer to recruit individuals who match the desired personality and skill profile.

This poses a challenge to universities on how to ensure both acquisition of technical skills in demand and promotion of student personal growth, by helping them to self-reflect, getting ready for changing circumstances and addressing unordinary situations, by looking for creative solutions and cooperating with others.

PERFORMANCE OF EUROPEAN UNIVERSITIES IN DEVELOPING 21ST CENTURY SKILLS



03

03 | PERFORMANCE OF EUROPEAN UNIVERSITIES IN DEVELOPING 21ST CENTURY SKILLS

The picture regarding the performance of universities in the development of 21st century skills looks reversed compared to the assessment of the importance of skills (see Figure 3.1). The main trend is that the skills that received the highest employer ratings in the importance assessment are relatively more difficult to acquire at the European universities.

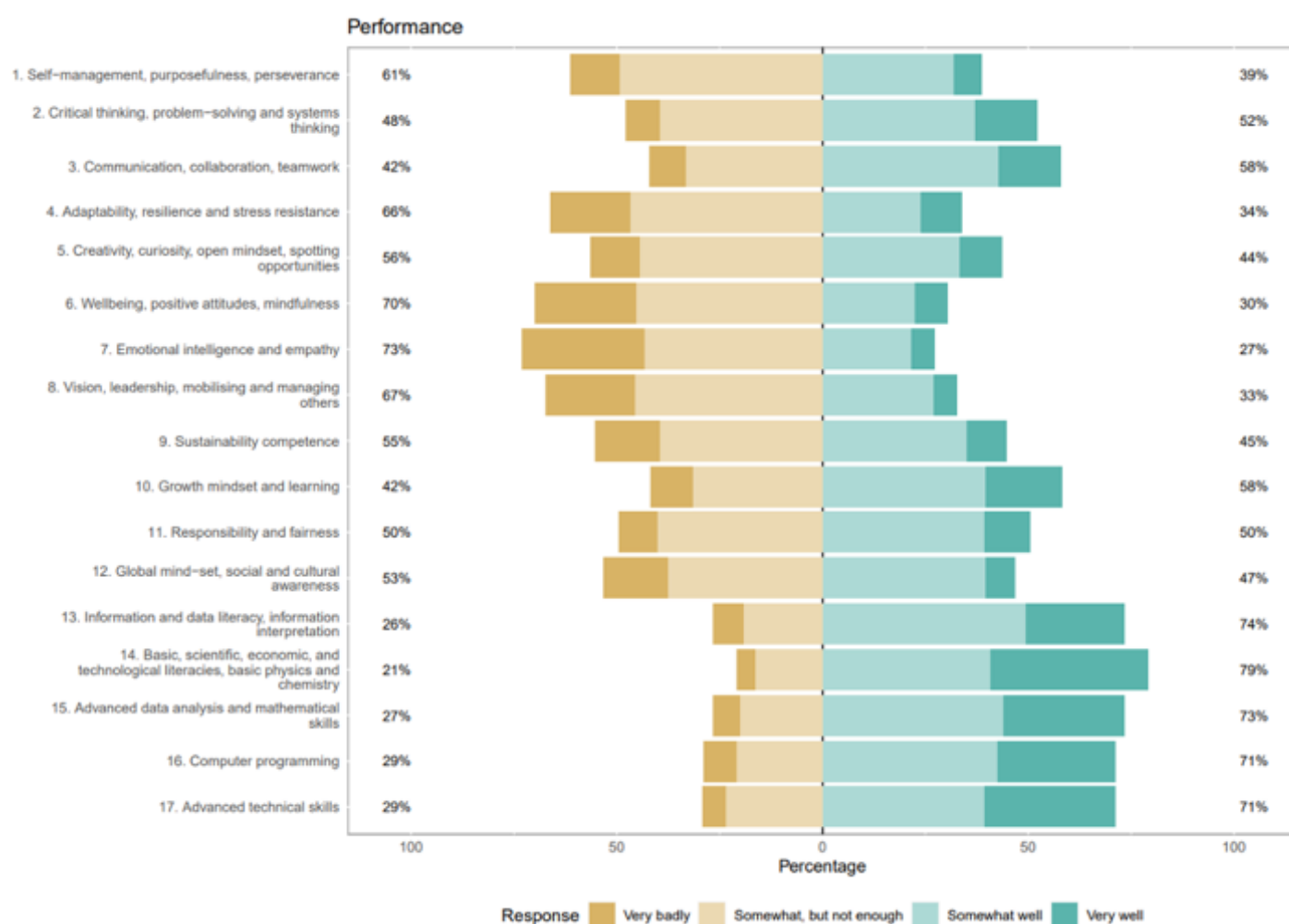


Figure 3.1. Employers’ assessment of the performance of universities in their countries in developing 17 key employability skills as needed in the 21st century labour market for their students

Source: Authors’ calculations based on employer survey conducted in 2022, n=300

Most negative assessments (over 50%) to the question “How well do universities in your country perform in developing these skills for their students?” received the following skills:



- 73%** ▶ ‘Emotional intelligence and empathy’
- 70%** ▶ ‘Wellbeing, positive attitudes, mindfulness’
- 67%** ▶ ‘Vision, leadership, mobilising and managing others’
- 66%** ▶ ‘Adaptability, resilience and stress resistance’
- 61%** ▶ ‘Self-management, purposefulness, perseverance’
- 56%** ▶ ‘Creativity, curiosity, open mindset, spotting opportunities’
- 55%** ▶ ‘Sustainability competence’
- 53%** ▶ ‘Global mind-set, social and cultural awareness’
- 50%** ▶ ‘Responsibility and fairness’



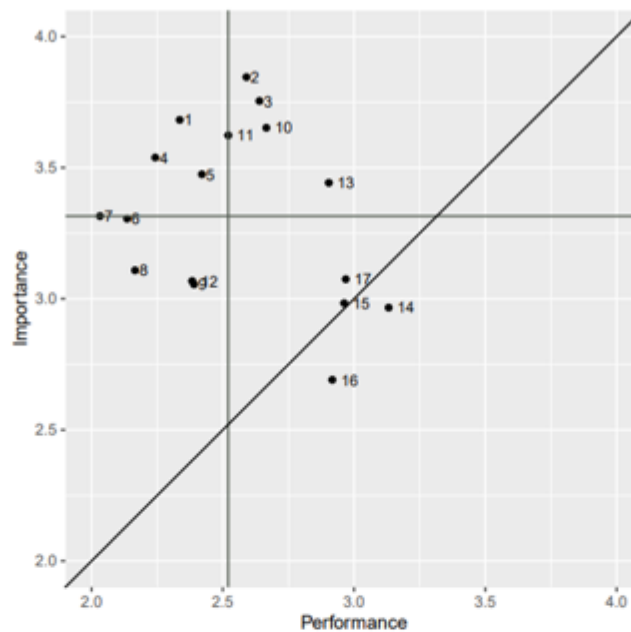
Considering the importance of these skills in the labor market and in general in the career development of graduates, it would be in the interest of universities to evaluate the curriculum and methods of learning, the range of support and extracurricular opportunities provided, in order to strengthen the appropriate personal development of students.

DETERMINING PRIORITIES FOR ACTION



04 | DETERMINING PRIORITIES FOR ACTION

The priority areas for action with regards to the 21st century skills improvement at the European universities were determined, based on the importance – performance analysis method developed by Martilla and James in 1977. The results can be seen in Figure 4.1.



- 1 – Self-management, purposefulness, perseverance
- 2 – Critical thinking, problem-solving and systems thinking
- 3 – Communication, collaboration, teamwork
- 4 – Adaptability, resilience and stress resistance
- 5 – Creativity, curiosity, open mindset, spotting opportunities
- 6 – Wellbeing, positive attitudes, mindfulness
- 7 – Emotional intelligence and empathy
- 8 – Vision, leadership, mobilising and managing others
- 9 – Sustainability competence
- 10 – Growth mindset and learning
- 11 – Responsibility and fairness
- 12 – Global mind-set, social and cultural awareness
- 13 – Information and data literacy, information interpretation
- 14 – Basic, scientific, economic, and technological literacies, basic physics and chemistry
- 15 – Advanced data analysis and mathematical skills
- 16 – Computer programming
- 17 – Advanced technical skills

Figure 4.1. Importance – performance analysis results of importance of 21st century skills and performance of universities in developing them
 Source: Authors’ calculations based on employer survey conducted in 2022, n=300

The most critical area requiring action is where importance of skills is high, but performance of universities is low. Underperformance in these areas requires **immediate attention and highest prioritization**:

5	▶	‘Creativity, curiosity, open mindset, spotting opportunities’
11	▶	‘Responsibility and fairness’
1	▶	‘Self-management, purposefulness, perseverance’
7	▶	‘Emotional intelligence and empathy’
4	▶	‘Adaptability, resilience and stress resistance’
6	▶	‘Wellbeing, positive attitudes and mindfulness’



It should be noted, however, that all skills placed above the diagonal line, should receive attention designing student experience at universities. These are the skills where their importance assessment exceeds performance assessment, and thus are in high priority for improvement and opportunity (Bacon, 2003). Points, falling in the region where importance is lower than performance indicates low priorities. This suggests that only 'computer programming' (16) and 'basic, scientific, economic and technological literacies, basic physics and chemistry' (14) can be acquired at universities at satisfactory levels according to the employers.

LATVIA IN FOCUS



05



05 | LATVIA IN FOCUS

From Latvia, 94 enterprises participated in the survey, mainly large and medium-sized enterprises operating in the services and production sectors (see Table 1).

Sector	Number	%	Number of employees	Number	%
Construction	3	3.19%	1-10 (micro)	12	12.77%
Production	23	24.47%	11-49 (small)	12	12.77%
Services	58	61.70%	50-249 (medium-sized)	23	24.47%
Trade	10	10.64%	Over 250 employees (large)	47	50.00%

Years in business	Number	%	Ownership	Number	%
More than 10 years	71	75.53%	National ownership	62	66%
6 – 10 years	16	17.02%	National and foreign ownership	10	11%
Less than 5 years (a startup)	7	7.45%	Foreign ownership	21	22%
			Employer association	1	1%

Table 1. Distribution of respondent by broad economic areas, number of employees, years in business and ownership

Source: Authors' calculations based on employer survey conducted in 2022, n=94

When it comes to the importance of employability skills of STEM graduates as needed in the 21st century labour market, 100% of Latvian employers are convinced of the importance of 'self-management, purposefulness, perseverance' and 'critical thinking, problem-solving and systems thinking', almost as many – of 'communication, collaboration and teamwork' (99%) (see Figure 5.1).

The other priority 21st century skills according to Latvian employers are: 'growth mindset and learning' (97%), 'responsibility and fairness' (96%), 'adaptability, resilience and stress resistance' (95%), 'information and data literacy, information interpretation' (95%), 'Creativity, curiosity, open mindset, spotting opportunities' (91%), 'Wellbeing, positive attitude and mindfulness' (91%).



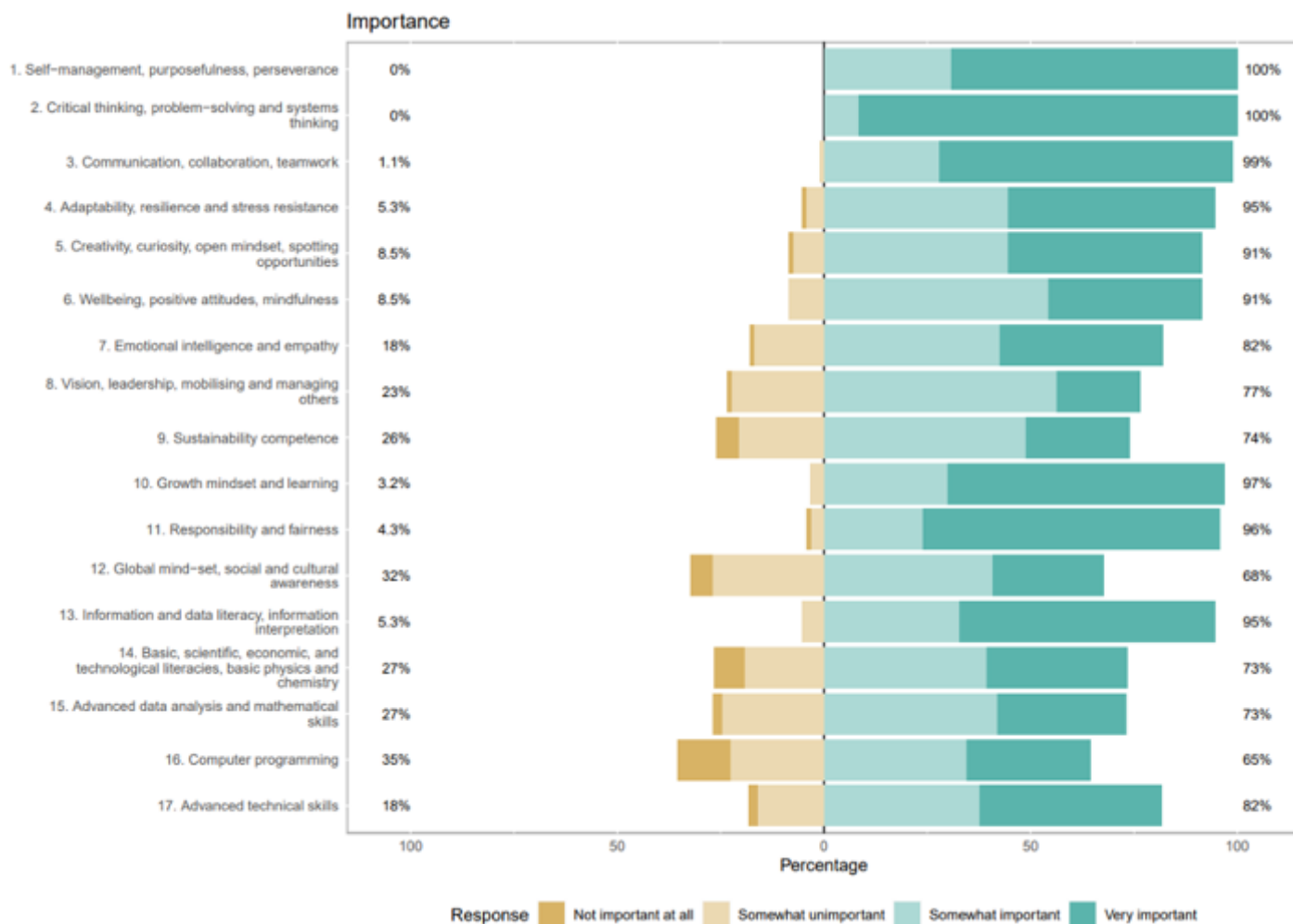


Figure 5.1. Employers' assessment of the importance of 17 key employability skills of STEM graduates as needed in the 21st century labour market in Latvia

Source: Authors' calculations based on employer survey conducted in 2022, n=94



When it comes to the Latvian employers' assessment of the performance of universities (see Figure 5.2), the least developed 21st century skills in Latvian universities seem to be 'Emotional intelligence and empathy' (72% of negative assessments), 'Wellbeing, positive attitudes, mindfulness' (71%), 'Vision, leadership, mobilising and managing others' (62%) and 'Adaptability, resilience and stress resistance' (60%).

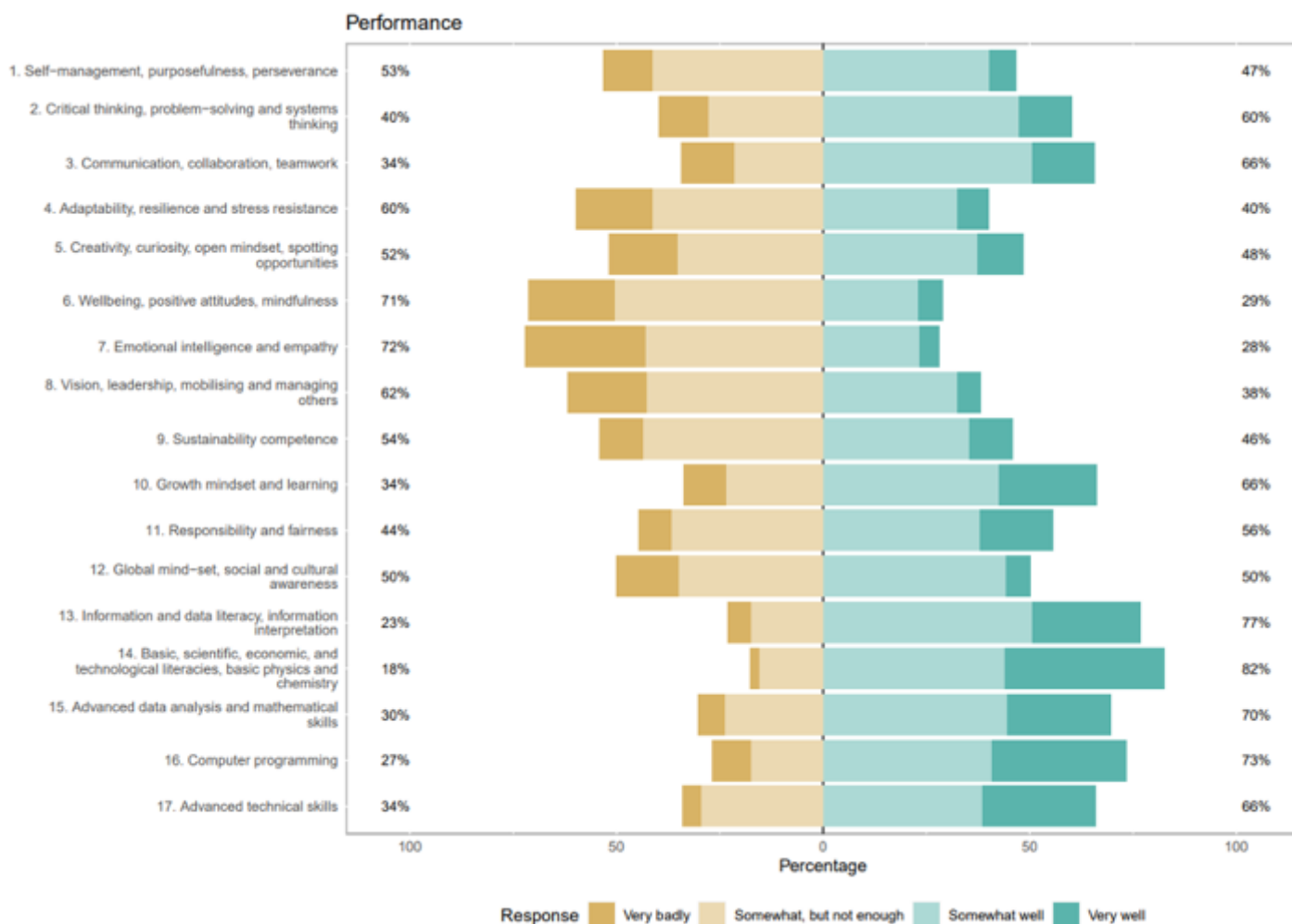


Figure 5.2. Employers' assessment of the performance of universities in their countries in developing 17 key employability skills as needed in the 21st century labour market for their students in Latvia

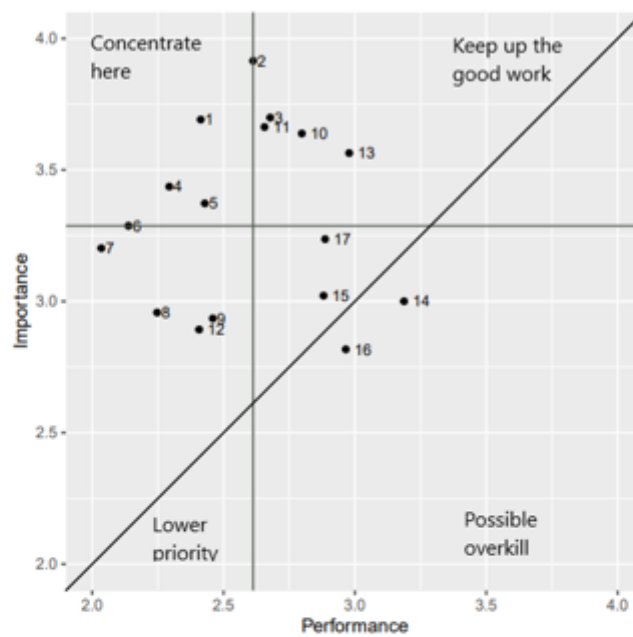
Source: Authors' calculations based on employer survey conducted in 2022, n=94

Thus, the opinion of Latvian employers is largely consistent with the opinion of European employers.

According to the importance – performance analysis, **immediate attention and highest prioritisation** in improving student learning experiences in Latvia is required in the following 21st century skills areas:

- 1 ▶ 'Self-management, purposefulness, perseverance'
- 4 ▶ 'Adaptability, resilience and stress resistance'
- 5 ▶ 'Creativity, curiosity, open mindset, spotting opportunities'
- 2 ▶ 'Critical thinking, problem-solving and systems thinking'
- 6 ▶ 'Wellbeing, positive attitudes, and mindfulness'





- 1 – Self-management, purposefulness, perseverance
- 2 – Critical thinking, problem-solving and systems thinking
- 3 – Communication, collaboration, teamwork
- 4 – Adaptability, resilience and stress resistance
- 5 – Creativity, curiosity, open mindset, spotting opportunities
- 6 – Wellbeing, positive attitudes, mindfulness
- 7 – Emotional intelligence and empathy
- 8 – Vision, leadership, mobilising and managing others
- 9 – Sustainability competence
- 10 – Growth mindset and learning
- 11 – Responsibility and fairness
- 12 – Global mind-set, social and cultural awareness
- 13 – Information and data literacy, information interpretation
- 14 – Basic, scientific, economic, and technological literacies, basic physics and chemistry
- 15 – Advanced data analysis and mathematical skills
- 16 – Computer programming
- 17 – Advanced technical skills

Figure 5.3. Importance – performance analysis results of importance of 21st century skills skills and performance of universities in developing them in Latvia

Source: Authors' calculations based on employer survey conducted in 2022, n=94



However, almost all 21st century skills require improvement in their teaching at universities, as importance assessment exceeds the assessment of performance of universities for almost all skills.

SERBIA IN FOCUS



06

06 | SERBIA IN FOCUS

From Serbia, 26 enterprises participated in the survey, mainly large and medium-sized enterprises operating in the production and services sectors (Table 2).

Sector	Number	%	Number of employees	Number	%
Construction	5	19.23%	1-10 (micro)	4	15.38%
Production	11	42.31%	11-49 (small)	4	15.38%
Services	7	26.92%	50-249 (medium-sized)	9	34.62%
Trade	3	11.54%	Over 250 employees (large)	9	34.62%

Table 2. Distribution of respondent by broad economic areas and by number of employees
Source: Authors' calculations based on employer survey conducted in 2022, n=26

When it comes to the importance of employability skills of STEM graduates as needed in the 21st century labour market, 100% of Serbian employers are convinced of the importance of 'self-management, purposefulness, perseverance', 'critical thinking, problem-solving and systems thinking', 'communication, collaboration and teamwork', 'growth mindset and learning' and 'responsibility and fairness'. Almost as many employers (96%) are convinced of the importance of 'adaptability, resilience and stress resistance' and 'information and data literacy, information interpretation' (see Figure 6.1).



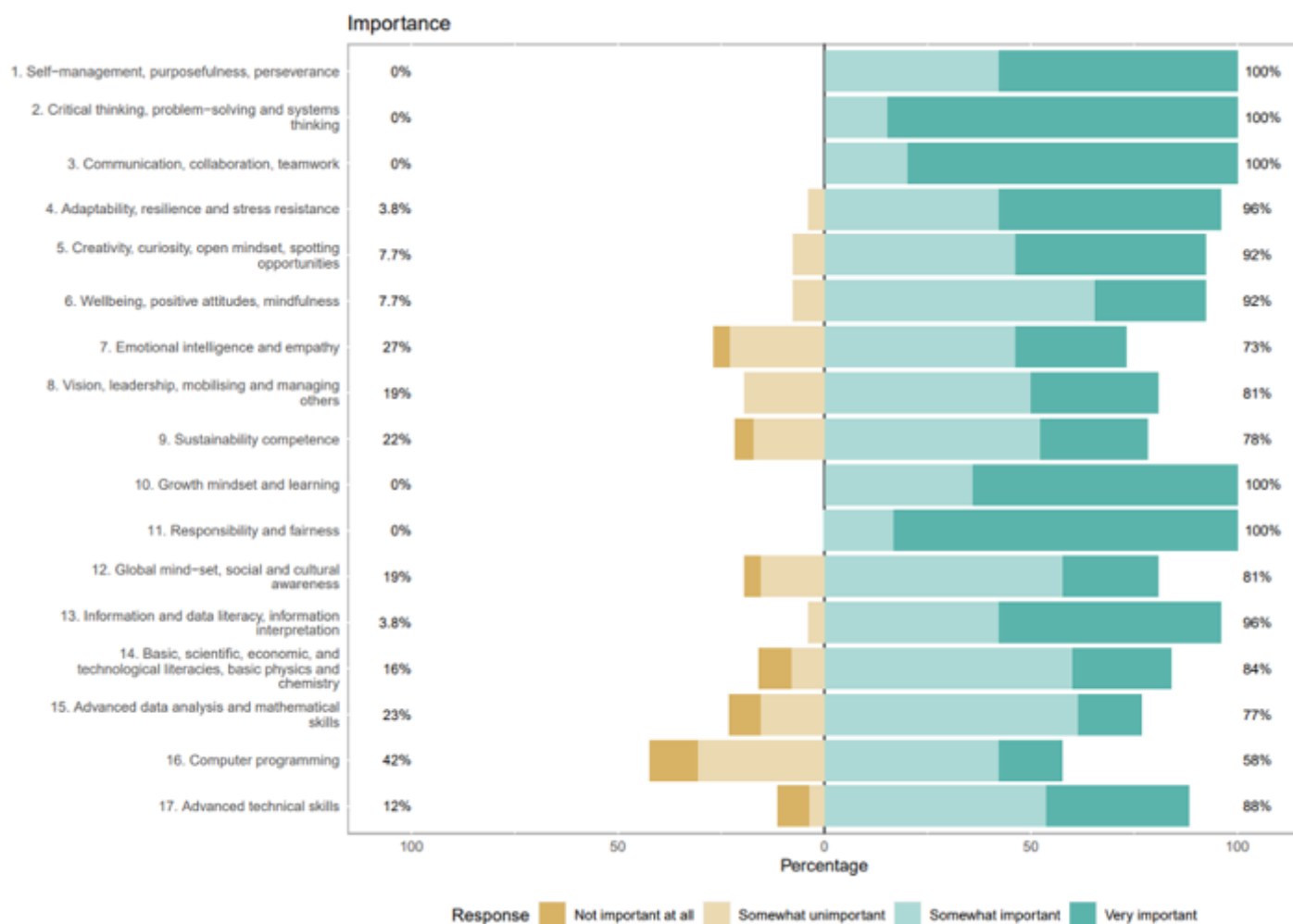


Figure 5.1. Employers' assessment of the importance of 17 key employability skills of STEM graduates as needed in the 21st century labour market in Serbia
 Source: Authors' calculations based on employer survey conducted in 2022, n=26



When it comes to the Serbian employers' assessment of the performance of universities (see Figure 6.2), the least developed 21st century skills in Serbian universities seem to be 'Vision, leadership, mobilising and managing others' (77% of negative assessments), 'Wellbeing, positive attitudes, mindfulness' (74%), 'Emotional intelligence and empathy' (72%) and 'Self-management, purposefulness, perseverance' (69%).

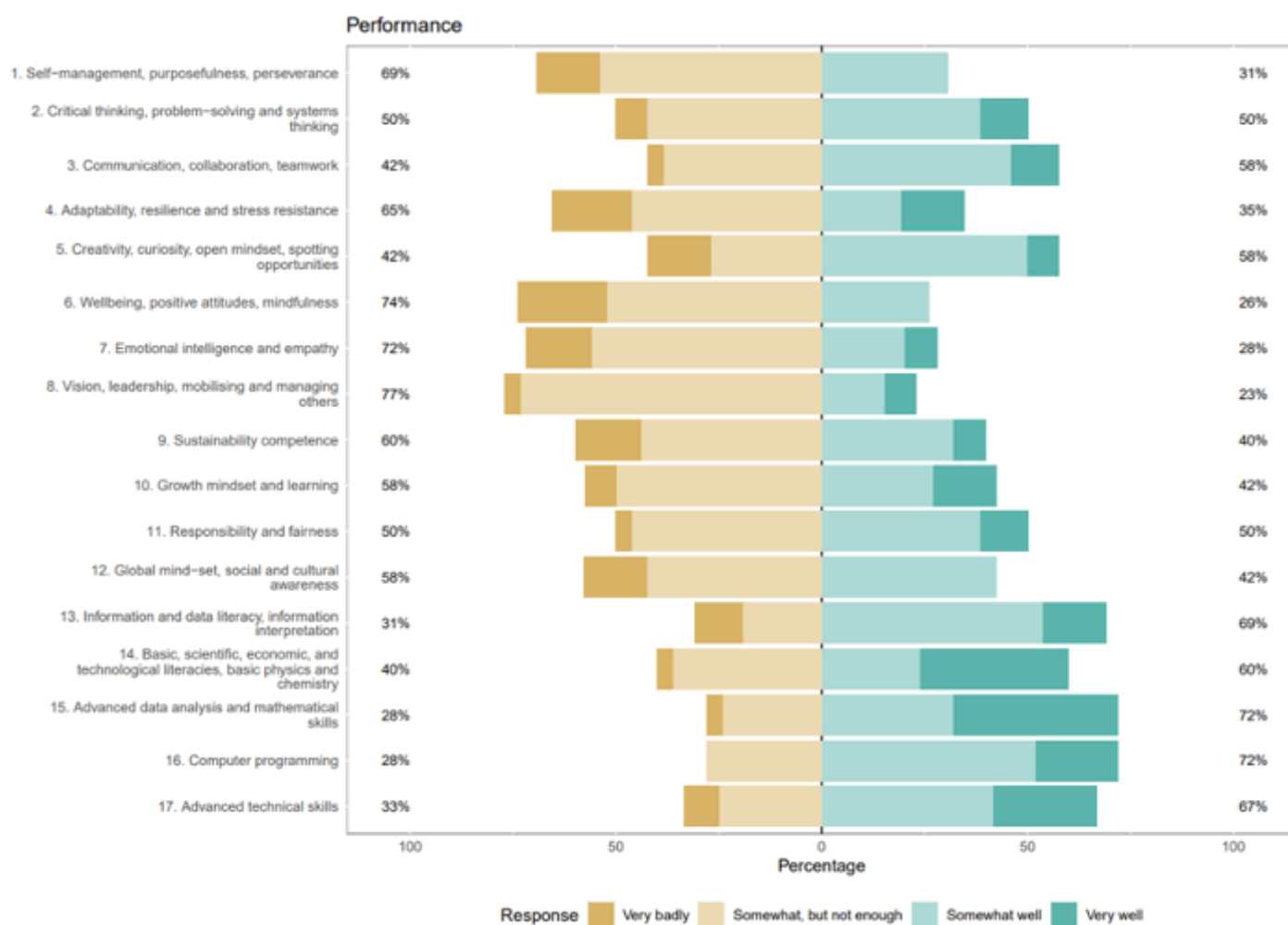
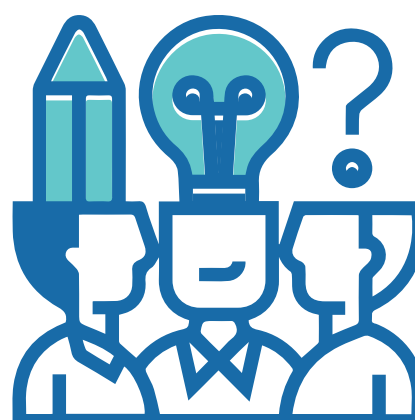


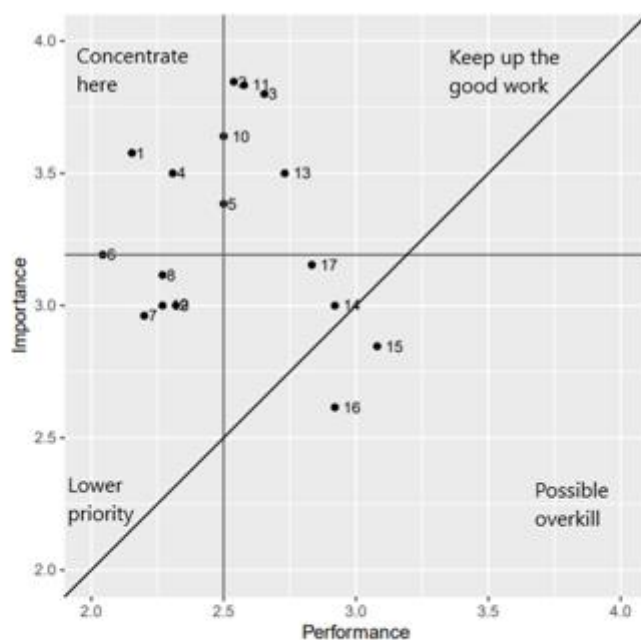
Figure 5.2. Employers' assessment of the performance of universities in their countries in developing 17 key employability skills as needed in the 21st century labour market for their students in Serbia
 Source: Authors' calculations based on employer survey conducted in 2022, n=26

Thus, the opinion of Serbian employers is to a large extent consistent with the opinion of European employers.

According to the importance – performance analysis, **immediate attention and highest prioritisation** in improving student learning experiences in Serbia is required in the following 21st century skills areas:

- 1 ▶ 'Self-management, purposefulness, perseverance'
- 4 ▶ 'Adaptability, resilience and stress resistance'
- 5 ▶ 'Creativity, curiosity, open mindset, spotting opportunities'
- 10 ▶ 'Growth mindset and learning'
- 6 ▶ 'Wellbeing, positive attitudes, and mindfulness'





- 1 – Self-management, purposefulness, perseverance
- 2 – Critical thinking, problem-solving and systems thinking
- 3 – Communication, collaboration, teamwork
- 4 – Adaptability, resilience and stress resistance
- 5 – Creativity, curiosity, open mindset, spotting opportunities
- 6 – Wellbeing, positive attitudes, mindfulness
- 7 – Emotional intelligence and empathy
- 8 – Vision, leadership, mobilising and managing others
- 9 – Sustainability competence
- 10 – Growth mindset and learning
- 11 – Responsibility and fairness
- 12 – Global mind-set, social and cultural awareness
- 13 – Information and data literacy, information interpretation
- 14 – Basic, scientific, economic, and technological literacies, basic physics and chemistry
- 15 – Advanced data analysis and mathematical skills
- 16 – Computer programming
- 17 – Advanced technical skills

Figure 5.3. Importance – performance analysis results of importance of 21st century skills and performance of universities in developing them in Serbia

Source: Authors' calculations based on employer survey conducted in 2022, n=26



However, almost all 21st century skills require improvement in their teaching at universities, as importance assessment exceeds the assessment of performance of universities for almost all skills.

21ST CENTURY SKILLS IN A NUTSHELL



07



7 | 21ST CENTURY SKILLS IN A NUTSHELL

A meta-framework of 21st century skills

The list of 21st century skills used in the employer survey was developed by conducting a meta-analysis of ten recent (published in 2018 – 2022) and research-based skills frameworks describing the future and labour market-relevant skills. All the selected skills frameworks have been developed by international organisations, including by the European Commission (McCallum, Weicht, McMullan, & Price, 2018; Sala, Punie, Garkov, & Cabrera, 2020; Bianchi, Pisiotis, & Cabrera Giraldez, 2022; Vuorikari, Kluzer, & Punie, 2022), OECD (2018), World Economic Forum (2020), McKinsey & Company (2021), Coursera (2021), Cedefop and Eurofound (2018). Each 21st century skills identified as a result of this analysis describes a group of interrelated skills that were included in the skills frameworks. It should be noted that the list of 21 CS has been developed to include general competencies and competencies that apply equally to all areas of STEM education. It does not cover professional skills or skills that are specific only to certain fields or occupations.

The following section of the report describes what the most important 21st century skills are and which sub-skills they include, based on the literature review.



Self-management, purposefulness, perseverance

The skills mentioned in the international skills framework, which the authors consider to be related to each other and which are combined in this group of skills, are:

- Autonomy
- Self-efficacy
- Self-awareness and self-management
- Self-control, self-regulation, self-direction
- Goals achievement
- Goal orientation and completion (e.g., grit, persistence)
- Decision making
- Motivation & perseverance
- Planning & management
- Project management
- Risk management
- Resource management skills
- Purposefulness

According to the ESCO (European Commission, n.d.), self-management skills and competences require individuals to understand and control their own capabilities and limitations and use this self-awareness to manage activities in a variety of contexts. They include the ability to act reflectively and responsibly, to accept feedback, adapting to change and to seek opportunities for personal and professional development. Self-management skills and competencies can alternatively be called as:

- self-control
- self-regulation
- self-management
- self-discipline and
- professional attitude

According to research purposefulness is a volitional quality, that characterized by the goals and objectives, orderliness and balance of actions, thoughts, and feelings with a steady movement towards the goal. It is the quality of having a sense of direction and a strong motivation to achieve a specific outcome. Perseverance is the human abilities to storage energy by long-term, to achieve the goal, to overcome the difficulties of varying magnitude (Griban et al., 2020). Together, purposefulness and perseverance are important qualities that can help an individual achieve their goals and overcome challenges.



Critical thinking, problem-solving and systems thinking

Related skills:

- Analytical thinking
- Cognitive processes and strategies
- Critical thinking and decision making
- Problem framing
- Problem-solving, complex problem-solving
- Reasoning, problem-solving and ideation
- System skills
- Systems analysis and evaluation

According to the ESCO (European Commission, n.d.), thinking skills and competences are related to the ability to apply the mental processes of gathering, conceptualizing, analysing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication. They include the ability to evaluate and use information of different kinds to plan activities, achieve goals, solve problems, deal with issues and perform complex tasks in routine and novel ways. Thinking skills and competences can alternatively be called as:

- Cognitive skills and competences
- Use of reason and logic

Critical thinking is a higher-order thinking skill that is crucial to cope with uncertainty, complexity, and change. It entails a self-directed, skilful analysis of information, beliefs or knowledge, with an ongoing reconstruction of one's thinking knowledge about methods to assess and produce new knowledge and strategies to solve problems. It assumes awareness of the egocentric and sociocentric tendencies of human thinking that may produce flaws in the quality of reasoning, as well as willingness to critically assess and evaluate information (Sala, Punie, Garkov and Cabrera, 2020).

Problem-solving is the process of finding solutions to difficult or complex issues' (Simpson, Weiner, & Oxford University Press, 1989). Problem-solving normally requires the use of a range of tools and information resources. The core characteristic of problem-solving is

that it is impossible for a person to achieve the goal through routine actions. In problem-solving, one has to reflect on the situation in order to identify the proper arrangement of decisions and actions that may lead to a solution. It often involves interaction with other individuals, and thus communicating in spoken or written form may be one of the actions necessary to solve the problem. Tools and technologies can normally facilitate the resolution of the problems (OECD, 2012).

Critical thinking and problem-solving skills are closely related to other employability competencies. According to Council of the EU (2018), a problem-solving attitude supports the learning process and the individual's ability to handle obstacles and change. It includes the desire to apply prior learning and life experiences and the curiosity to look for opportunities to learn and develop in a variety of life contexts.

Communication, collaboration and teamwork

Related skills:

- Collaboration
- Communication
- Developing relationships
- Engagement/ communication skills/ collaboration skills
- Generic skills/ competencies
- Interpersonal skills
- Selling, persuading, sales
- Serving, attending, including caring
- Social skills
- Teamwork, working with others, teamwork effectiveness



According to the ESCO (European Commission, n.d.), social and communication skills and competences are related to the ability to interact positively and productively with others. This is demonstrated by communicating ideas effectively and empathetically, coordinating one's own objectives and actions with those of others and acting in ways which are structured according to values, ensuring the well-being and progress of others, and offering leadership. Social and communication skills and competences can alternatively be called as:

- Social interactions
- Interpersonal abilities
- Interpersonal skills
- Social interaction
- Social skills

Sala, Punie, Garkov and Cabrera (2020, p.20) offers the following definitions and descriptors for communication and collaboration (see Table below):

Competence and its definition	Descriptors
<p style="text-align: center;">Communication</p> <p>Use of relevant communication strategies, domain-specific codes and tools, depending on the context and content</p>	<ul style="list-style-type: none"> ▪ Awareness of the need for a variety of communication strategies, language registers, and tools that are adapted to context and content. ▪ Understanding and managing interactions and conversations in different socio-cultural contexts and domain-specific situations. ▪ Listening to others and engaging in conversations with confidence, assertiveness, clarity and reciprocity, both in personal and social contexts.
<p style="text-align: center;">Collaboration</p> <p>Engagement in group activity and teamwork acknowledging and respecting others</p>	<ul style="list-style-type: none"> ▪ Intention to contribute to the common good and awareness that others may have different cultural affiliations, backgrounds, beliefs, values, opinions or personal circumstances. ▪ Understanding the importance of trust, respect for human dignity and equality, coping with conflicts and negotiating disagreements to build and sustain fair and respectful relationships. ▪ Fair sharing of tasks, resources and responsibility within a group taking into account its specific aim; eliciting the expression

Most of the emerging jobs which are expected to expand between now and 2025 will require strong collaboration and communication skills (European Commission, Joint Research Centre, Goenaga, Gonzales, Napierala, et al., 2019).

Growth mindset and learning

Related skills:

- Active learning and learning strategies
- Continuous learning, lifelong learning
- Growth mindset
- Learning through experience
- Learning to learn, managing learning, meta-learning skills
- Manual skills for information and communication technology (related to learning strategies)

The European framework of key competencies for lifelong learning (Council of the EU, 2018) views leaning to learn competence together with personal and social competencies and explains as ‘the ability to reflect upon oneself, effectively manage time and information, work with others in a constructive way, remain resilient and manage one’s own learning and career. It includes the ability to cope with uncertainty and complexity, learn to learn, support one’s physical and emotional

well-being, to maintain physical and mental health, and to be able to lead a health-conscious, future-oriented life, empathize and manage conflict in an inclusive and supportive context.’



Growth mindset is critical starting point for anyone's learning journey. According to Sala, Punie, Garkov and Cabrera (2020), growth mindset - belief in one's and others' potential to continuously learn and progress – can be described by the following descriptors:



- 01 ▶ Awareness of and confidence in one's own and others' abilities to learn, improve and achieve with work and dedication.
- 02 ▶ Understanding that learning is a lifelong process that requires openness, curiosity and determination.
- 03 ▶ Reflecting on other people's feedback as well as on successful and unsuccessful experiences to continue developing one's potential.

A person's ability and willingness to proactively participate in lifelong learning and to adapt is essential in career success. Continuous lifelong learning is one way of staying fit in a job market context with shifting and ever-increasing employer demands (Tomlinson, 2012). Developmental psychology also shows that competence development does not end at adolescence but continues through the adult years. In particular, the ability to think and act reflectively grows with maturity (OECD, 2005). It dispels myths about the limited ability of adults to learn.

Responsibility and fairness

Related skills:

- Integrity
- Justice
- Productivity/ accountability
- Responsibility
- Supporting fairness
- Work ethic, conscientiousness



Responsibility is the state of being accountable for something, it involves being reliable, dependable, and accountable for one's actions and decisions, and taking ownership of their consequences.

Fairness is the quality of being equitable and impartial, it involves treating people equally and without bias and ensuring that everyone is given a fair and equal opportunity. According to new

research there are two main principles of fairness: equity and equality. Equity means that everyone is treated the same, regardless of their individual differences. Equality means that everyone is treated fairly, but not necessarily the same (Team, 2023). These skills are important in nowadays multicultural society. Responsibility and fairness are important principles that promote ethical behaviour and help to build trust and cooperation.

Adaptability, resilience and stress resistance

Related skills:

- Adaptability
- Agility
- Coping with uncertainty, ambiguity and risk
- Flexibility, adjustment, mental flexibility
- Perspective-taking and cognitive flexibility
- Resilience, stress resistance, stress tolerance

Boundaries between jobs, organisations and life roles are becoming blurred and people commonly experience careers comprised of many positions with multiple organisations and even industries. In these conditions, ability to adapt to changing conditions and to learn new things have become one of the core competencies in the labour market (Līce, 2019). These working environments require workers to continually manage change – in themselves and their contexts (Fugate et al., 2004).

As formulated by Harvey in 2005, employers are looking for recruits who are going to be effective in a changing world. They want intelligent, flexible, adaptable employees who are quick to learn and can work on a range of tasks simultaneously. They need people who can deal with change and thrive on it. Graduates are much more likely than non-graduates to meet these criteria. Employers do not need people who are resistant to new approaches or slow to respond to cues (Harvey, 2005). Also Tomlinson agrees (2012), that if individuals can capitalise upon their education and training and adopt relatively flexible and proactive approaches to their working lives, then they will experience favourable labour market returns and conditions. Employees who are willing to adapt to different kinds of changes will also consider a broader spectrum of opportunities, for example, jobs that require the acquisition of additional skills (Wittekind et al., 2010).

Creativity, curiosity, open mindset, spotting opportunities

Related skills:

- Creative thinking, creativity
- Curiosity
- Exploratory thinking
- Innovation, inventive thinking
- Open Mindset, intellectual openness
- Originality and initiative
- Spotting opportunities
- Valuing ideas

The European Commission's Entrepreneurship Competence Framework (Bacigalupo, Kampylis, Punie, Van den Brande, 2016), describes these skills as follows:

Competence and its hint	Descriptors
<p>Creativity Develop creative and purposeful ideas</p>	<ul style="list-style-type: none"> ▪ Develop several ideas and opportunities to create value, including better solutions to existing and new challenges. ▪ Explore and experiment with innovative approaches. ▪ Combine knowledge and resources to achieve valuable effects.
<p>Valuing ideas Make the most of ideas and opportunities</p>	<ul style="list-style-type: none"> ▪ Judge what value is in social, cultural and economic terms. ▪ Recognise the potential an idea has for creating value and identify suitable ways of making the most out of it.
<p>Taking the initiative Go for it</p>	<ul style="list-style-type: none"> ▪ Initiate processes that create value. ▪ Take up challenges. ▪ Act and work independently to achieve goals, stick to intentions and carry out planned tasks.
<p>Spotting opportunities Use your imagination and abilities to identify opportunities for creating value.</p>	<ul style="list-style-type: none"> ▪ Identify and seize opportunities to create value by exploring the social, cultural and economic landscape. ▪ Identify needs and challenges that need to be met. ▪ Establish new connections and bring together scattered elements of the landscape to create opportunities to create value.

Information and data literacy, information interpretation

Related skills:

- Complex information processing and interpretation
- Information and data literacy
- Information literacy
- Media literacy



A vital skill these days is data literacy and information literacy. In research from Schield information literacy is a set of abilities requiring individuals to recognize when information is needed and can locate, evaluate, and use effectively the needed information. An information literate individual is able to: determine the extent of information needed, access the needed information effectively and efficiently, evaluate information and its sources critically, incorporate selected information into one's knowledge base, use information effectively to accomplish a specific purpose and understand the economic, legal and social issues surrounding the use of information, and access and use information ethically and legally (Schield, n.d.). Information literacy refers to the ability to find, evaluate and use information effectively and ethically. According to research data literacy is the ability to understand and use data effectively to inform decisions (View of Creating an Understanding of Data Literacy for a Data-driven Society, n.d.). It includes skills such as researching, analysing and communicating information. Data literacy refers to the ability to understand and work with data, including skills such as collecting and analysing data. Information interpretation refers to the process of understanding and making sense of information, including the ability to identify bias, assess credibility, and contextualize information.

Wellbeing, positive attitude and mindfulness

Related skills:

- Aspiration
- Efficacy and beliefs
- Gratitude and hope
- Identity, spiritual identity
- Metacognition
- Mindfulness
- Motivation and willingness, taking the initiative
- Positive core self-evaluation
- Reflection, reflective thinking, evaluating, monitoring
- Self-competencies, self-efficacy, positive self-orientation
- Trust (in self, others, institutions)
- Wellbeing



Positive attitudes, optimism and a sense of personal purpose enhances the motivation to actively pursue long-term goals. Oxford English dictionary defines motivation as ‘a reason or reasons for acting or behaving in a particular way’ (Simpson, Weiner, & Oxford University Press, 1989). Someone who is motivated to get results notices ways to do better, to be entrepreneurial, to innovate, or to find a competitive advantage (Goleman, 1998). Motivation is a

starting point for successful participation in education and career development. Studies have found out that students with high intrinsic motivation and career self-efficacy are likely to attain strong educational results (Evans & Burck, 1992). A research by Judge and Bono (2001) has confirmed that individuals which are motivated seem generally more satisfied with their work and perform significantly better than others.

Optimism implies nurturing positive expectations about the possibility of succeeding in the present and the future. Self-efficacy is the sense of one’s worth, and positive belief and confidence in one’s own ability to successfully complete a task, and to obtain a positive outcome in a specific situation. Self-efficacy positively correlates with performance, as it contributes to perseverance and trying harder to succeed (Sala, Punie, Garkov and Cabrera, 2020).

Emotional intelligence and empathy

Related skills:

- Compassion
- Conflict resolution
- Emotional intelligence
- Empathy
- Equality, equity
- Human dignity
- Personal traits
- Service orientation

In 1990, Mayer and Salovey developed their first theory of emotional intelligence. They elaborated a model of emotional intelligence, which consisted of four different dimensions including

perception of emotion, emotional facilitation, understanding emotions, and management of emotions (Mayer & Salovey, 1997). They also proposed that emotional intelligence was a cognitive ability which is separate but also associated to, general intelligence. Their theory was subsequently popularized by Goleman. Goleman proposed (1998) that emotional intelligence was integral for life success. Emotional intelligence is not fixed genetically but develops throughout life alongside becoming more mature. He agreed that emotional intelligence skills are

synergetic with cognitive ones; and top performers have both. Emotional intelligence is especially important in complex jobs because a deficiency of these abilities can hinder the use of whatever technical expertise or intellect a person may have. Goleman divided competencies as purely cognitive, such as analytic reasoning or technical expertise (‘mind’) and emotional competencies, which combine thoughts and feelings (‘heart’) (Goleman, 1998).



According to Sala, Punie, Garkov and Cabrera (2020), empathy is the understanding of another person’s emotions, experiences and values, and the provision of appropriate responses. It can be described by the following descriptors:

01



Awareness of another person’s emotions, experiences and values.

02



Understanding another person’s emotions and experiences, and the ability to proactively take their perspective.

03



Responsiveness to another person’s emotions

Empathy enables effective communication, interaction and collaboration. It is well-acknowledged that emotional intelligence and empathy can be improved through specific training (Goleman, 1998; Cavallini, Bianco, Bottiroli, Rosi, Vecchi & Lecce, 2015) and it results in outstanding performance at work.



Critical thinking, problem-solving and systems thinking


Related skills:

- Leadership and responsibility
- Leadership and social influence
- Leadership and management
- Mobilizing others
- Persistence, grit
- Persuasion and negotiation
- Pro-activeness
- Productivity, accountability
- Vision

These skills are particularly important at any managerial position and entrepreneurial activity.

Vision refers to a clear and inspiring idea of the future that guides an individual. It is a long-term goal or desired outcome that provides direction and purpose.

According to research leadership is the ability to influence the activities of an individual or group toward the achievement of a goal (Addison, 1985). It is the ability to guide, motivate, and influence a group toward a common goal or vision. It involves setting a direction, creating a sense of purpose, and motivating and inspiring others to work together toward achieving that goal. Research from Elmuti et al. describes leadership as comprising mainly three elements: skills, perspectives, and dispositions (2005).



Managing refers to the process of organizing and coordinating resources to achieve goals. It involves planning, organizing, directing, and controlling activities to achieve specific objectives.

Mobilising others entails inspiring, enthusing and getting others on board. According to the European Commission's Entrepreneurship Competence Framework (Bacigalupo, Kampylis, Punie, Van den Brande, 2016), ability to mobilise others includes:

- Inspiring and enthusing relevant stakeholders.
- Getting the support needed to achieve valuable outcomes.
- Demonstrating effective communication, persuasion, negotiation and leadership.

CONCLUSIONS



CONCLUSIONS

Employers are in the best position to assess the labour market requirements and evaluate the performance of universities, as they directly encounter with the skills of graduates. It is essential to identify the labour market skills demands and consider them in the higher education development strategies to ensure the highest possible labour market outcomes for higher education graduates.

The tools for developing 21st century skills may not only be included in the content and methodology of study programs, but also in the overall ecosystem of the universities, in which the personal growth of students is promoted, including the environment of the university, support offered to students and extracurricular opportunities.

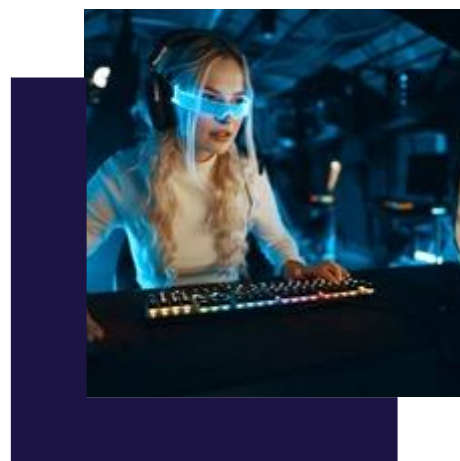
The overall tendency that can be identified is the labour market demands is the high assessment of self-management, social, emotional, attitudinal and cognitive skills, the skills that could be associated to personality, attitudes and thinking abilities, and less to the skills that could be traditionally acquired at the educational institutions. These skills are highly valued across all organizations in the labour market regardless of industry.

Considering the high challenge for universities to develop these skills comparing to other skills such as computer programming, mathematical skills, scientific literacies and advanced technical skills, which are also highly valued in the 21st century labour market, the employers might feel even more powerless in upskilling their employees and may prefer to recruit individuals who match the desired personality and skill profile.

This poses a challenge to universities on how to ensure both acquisition of technical skills in demand and promotion of student personal growth, by helping them to self-reflect, getting ready for changing circumstances and addressing unordinary situations, by looking for creative solutions and cooperating with others.

The tools for developing 21st century skills may not only be included in the curriculum and teaching methodology, but also in the overall ecosystem of the university, in which the personal growth of students is promoted, including the environment of the university, the overall support system and extracurricular opportunities.

Finally, considering the high employers' assessment of the selected 21st century skills included in the employer survey, it can be concluded that the international skills frameworks that served the basis for developing this list are largely in line with the European labour market demands. These include the skills frameworks developed by the European Commission and EU agencies, OECD, World Economic Forum and McKinsey & Company.



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ANNEXES

Annex, Table 1. Distribution of respondent enterprises by countries by broad economic areas

Country	Services, %	Production, %	Trade, %	Construction, %
Austria	42.86%	28.57%	28.57%	
Belgium	66.67%	16.67%	16.67%	
Bosnia	100.00%			
Bulgaria	50.00%	33.33%		16.67%
Croatia	80.00%	20.00%		
Cyprus	85.71%		14.29%	
Denmark	62.50%		25.00%	12.50%
Estonia	66.67%			33.33%
Finland	100.00%			
France	50.00%	25.00%	25.00%	
Germany	84.21%	10.53%	5.26%	
Greece	14.29%	28.57%	42.86%	14.29%
Hungary	33.33%	33.33%	33.33%	
Ireland	66.67%			33.33%
Italy	20.00%	42.86%	37.14%	
Latvia	61.70%	24.47%	10.64%	3.19%
Lithuania	55.56%	44.44%		
Luxembourg	66.67%	33.33%		
Malta	71.43%	14.29%	14.29%	
Netherlands	80.00%	20.00%		
Poland	50.00%		25.00%	25.00%
Portugal	57.14%	42.86%		
Romania	71.43%	14.29%	14.29%	
Serbia	26.92%	42.31%	11.54%	19.23%
Slovenia	50.00%	50.00%		
Spain	100.00%			
Sweden	33.33%	33.33%	33.33%	
United Kingdom	100.00%			
USA		100.00%		

Annex, Table 2. Distribution of respondent enterprises by countries by the size of enterprises

Country	Over 250 employees (large)	50-249 (medium-sized)	11-49 (small)	1-10 (micro)
Austria	42.86%	28.57%	14.29%	14.29%
Belgium	16.67%	33.33%	16.67%	33.33%
Bosnia				100.00%
Bulgaria		83.33%	16.67%	
Croatia	80.00%			20.00%
Cyprus	42.86%	42.86%		14.29%
Denmark	12.50%	25.00%	25.00%	37.50%
Estonia	33.33%		66.67%	
Finland	0.00%	100.00%		
France	50.00%	50.00%		
Germany	21.05%	21.05%	36.84%	21.05%
Greece	71.43%	28.57%		
Hungary	33.33%	66.67%		
Ireland	33.33%		22.22%	44.44%
Italy	94.29%	5.71%		
Latvia	50.00%	24.47%	12.77%	12.77%
Lithuania	11.11%	66.67%	11.11%	11.11%
Luxembourg	66.67%		33.33%	
Malta	28.57%	28.57%	28.57%	14.29%
Netherlands	40.00%	20.00%	20.00%	20.00%
Poland	75.00%	25.00%		
Portugal	57.14%	42.86%		
Romania	57.14%	14.29%		28.57%
Serbia	34.62%	34.62%	15.38%	15.38%
Slovenia	50.00%	25.00%	25.00%	
Spain	50.00%	25.00%		25.00%
Sweden	66.67%		33.33%	
United Kingdom	50.00%			50.00%
USA	100.00%			



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