



# Future Skills

The future of learning  
and higher education

Ulf-Daniel Ehlers

The Future Skills Report

International Delphi Survey of the *NextSkills Project*

2019

## Disclaimer

*The Future Skills Report* presents information and data that were compiled and/ or collected through a research team from Baden-Wurtemberg Cooperative State University in Karlsruhe, Germany. Data in this report is subject to change without notice. The Future Skills project is ongoing. For further information please contact us!

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## Report history

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## Information about the NextSkills Project

This Delphi Survey is part of the Research Initiative NextSkills on “Future Skills – Future Learning and Future Higher Education”, which started in 2015. It includes research on learning and change on organizations pathways to the future, their conceptions of the future workplace and the definitions of futures skills and involves data- and methodological triangulation in three separate modules building on each other.

Module A: Analysis of future organizations competence and skill development concepts through expert ratings from a sample from more than 120 business and public organizations in order to identify advanced future organizations (2015-2017).

Module B: In-depth interview series with more than 20 HR-, change- and business experts as well as students on future skills, future learning and future higher education from 17 different future organizations (2017-2018).

Module C: Delphi Survey on future skills, and drivers and scenarios for future learning and future higher education (2018-2019).

## Get more information on the projects here:

[www.next-education.org](http://www.next-education.org) – Information on the research group and related projects

[www.nextskills.org](http://www.nextskills.org) – Information about the NextSkills Project

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## Key Findings

Research on future skills is the current hot topic of the day with fundamental changes in the job market due to a number of powerful drivers. While many studies focus on the changes brought through digital technologies, they relate future skills directly to digital skills, which - as important as they are - only represent one side of the future skill coin. The results presented from this Delphi survey are taking a broader approach and go beyond digital skill demands. The approach elaborates on an experts' informed vision of future higher education (HE), taking into account the demand for future skills, outlines the four signposts of change which will shape the learning revolution in higher education and presents a first model of future skills for future graduates.

It is part of an overarching research project on "next skills" ([www.nextskills.org](http://www.nextskills.org)) and collates opinions from an international experts' panel of almost 50 experts from higher education and business. Experts were asked both, the degree of relevance, as well as the timeframe of adoption for future skills, future higher education scenarios and the driving pillars of change.

### I. Future Skills

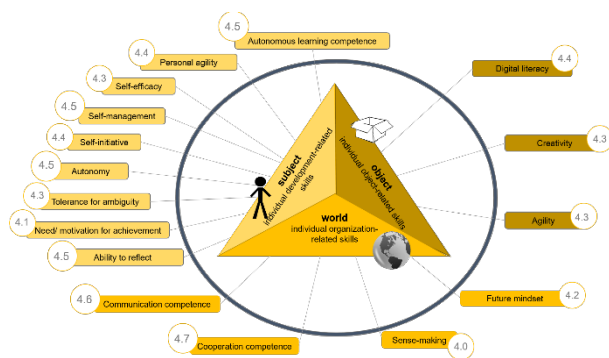
The term "future skills" is defined as the 'ability to act successful on a complex problem in a future unknown context of action'. It refers to an individuals' *disposition* to act in a self-organized way, visible to the outside as performance.

The future skills model divides future skills into three interrelated dimensions: The first Future Skill dimension is the *subjective dimension* of futures skills profiles. It is relating to an individuals' subjective, personal abilities to learn, adapt and develop in order to improve their opportunities to productively participate in the workforce of tomorrow, actively shape the future working environment and involve themselves into forming societies to cope with future challenges. It contains seven future skill profiles.

The second Future Skill Dimension is relating to an individual's ability to act self-organized in relation to an object (*object dimension*), a task or a certain subject matter related issue. It is emphasizing a new approach which is rooted into the current understanding of knowledge but is suggesting to take knowledge several steps up the ladder, connect

it to motivation, values and purpose and impregnate it with the disposition to act self-organized in the knowledge domain in question. It is not just a quest for more knowledge but for dealing with knowledge in a different way which is resulting into professionalism and not into knowledge expertise.

The third Future Skill Dimension is relating to an individual's ability to act self-organized in relation to its social environment (social-dimension), the society and organizational environment. It is emphasizing the individuals dual role as the curator of its social portfolio of membership in several organizational spheres and at the same time having the role of rethinking organizational spaces and creating organizational structures anew to make it future proof. It contains an array of five skill profiles.



Within these three dimensions, sixteen skill profiles have been defined. A skill profile is an array containing further subskills.

*A. Subject-development related skills:* (1) Autonomy (self-determination), (2) Self-initiative (initiative and performance competence), (3) Self-management (decision competence) (4) Need/motivation for achievement (initiative and performance competence), (5) Personal agility (self-competence), (6) Autonomous learning competence (learning literacy), (7) Self-efficacy, (8) Tolerance for ambiguity (ambiguity competence), (9) Ability to reflect (reflective competence)

*B. Object-related skills (Instrumental skills):* (10) Agility (systems competence), (11) Creativity (innovation competence), (12) Digital literacy

*C. Social world/ organization-related skills:* (13) Sense-making, (14) Future mindset (future and

design competence), (15) Cooperation competence, (16) Communication competence

## II. Future Learning

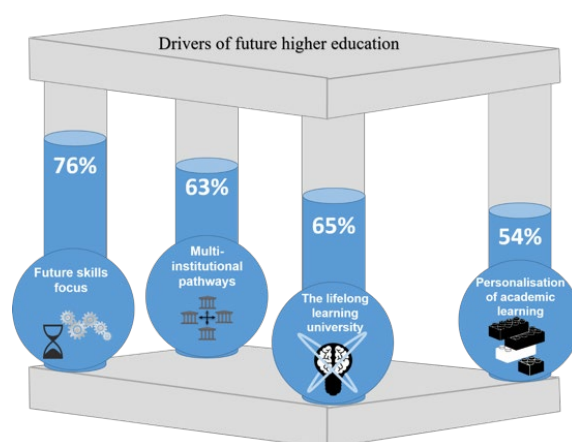
The Delphi resulted into hallmark indications on the shift from academic education and teaching to active learning of choice and autonomy. Higher education institutions in the future will provide a learning experience which is fundamentally different than the model of today. Timeframe for the time of adoption vary but for many aspects a close or mid-term timeframe has been estimated through the Delphi experts. The dimensions of future learning in higher education will comprise (1) **structural aspects**, i.e. academic learning as episodic process between biographical phases professional and private episodes throughout life, learning as institutional patchwork instead of the current widest-spread one-institution-model of today, supported through more elaborated credit transfer structures, micro-qualifications and microcredentials, as well as aspect of (2) **pedagogical design of academic learning**, i.e. changing practices of assessment, also peer-validation, learning communities, focus on future skills with knowledge playing an enabling role in interactive socio-constructive learning environments). In general experts estimate structure changes to become relevant much later than changes related to academic learning design.

## III. Drivers of Change in Higher Education

Four key drivers in the higher education market can be described. Each driver has a radical change potential for higher education institutions and together they mutually influence each other and span the room in which higher education likely will develop.

There are 2 content and curriculum related drivers (i.e. (1) personalized higher education and (2) future skill focus) and 2 organization-structure related drivers (i.e. (1) multi-institutional study pathways, (2) Lifelong Higher Learning)

The profile, shape and nature of higher education in the future will be most probably a certain pattern of configuration along the impact each of the four key drivers, called “pillars of change” has, and will influence the development of higher education strategies.



*1 - An emerging focus on future skills radically changes the current definition of graduate attributes in higher education:* The focus on a “next mode” of studying (focus on future skills: autonomous learning, self-organization, applying and reflecting knowledge, creativity and innovation, etc.) gradually replaces a reduced/narrow focus on academic and valid knowledge acquisition as a means to provide correct answers for known questions based on a curriculum which is focused on defined skills for fixed professions.

*2 - Higher education increasingly becomes a multi-institutional study experience:* The provision of higher education increasingly moves from a ‘one-institution’ model to a ‘multi-institution’ model in which higher education is provided through alliances of several institutions.

*3 - Students build their own personalized curriculum:* The elements of choice in academic programs enlarge. The curriculum of academic programs moves from a fully predefined and ‘up-front’ given structure to a more flexible, personalized and participatory model in which students actively cooperate with professors/ teachers/ advisors in curriculum building of higher education programs.

*4 - Higher education institutions turn towards providing offerings for lifelong higher learning services:* The current model of higher education, to prepare students (up front) for a future profession, is equally complimented with higher lifelong learning offerings.

## IV. Four Scenarios for Future HE

The Delphi survey made a point to view future higher education from a students’ perspective and

envisioned future learning experiences. Four scenarios for future higher education can be described as gravitation centers of organizational development: (1) the future skill university scenario, (2) the networked multi-institutional study scenario, (3) the my-university scenario, (4) the lifelong higher learning scenario.

Three out of four scenarios score with a time of adoption of more than 10 years from today with the majority experts. Only the lifelong higher learning scenario scored for a time for adoption within the next 5 years with the majority of experts.

*1 - The 'future skill' university:* The 'future skill' scenario suggests that higher education institutions would leave the current model that focusses on knowledge acquisition. Instead, new profiles would be developed that emphasize graduates' future skill development. In this scenario, HE would mainly be organized around one key objective: to enable the development of graduates' future skills, i.e. complex problem solving, dealing with uncertainty or developing a sense of responsibility, etc. This would not replace but go beyond the current emphasis of knowledge acquisition and studying based on defined curricula for fixed professions.

*2 - The networked, university:* This scenario views higher education as a networked study experience. It will not be down to a single institution providing a student with a certain program, but that this role would be split among multiple institutions. This means that 'digital import' and 'digital export' of parts of the curriculum would play a significant role. The standard HE study structure and experience would shift from a "one-institution" model to a "multi-institutional" model.

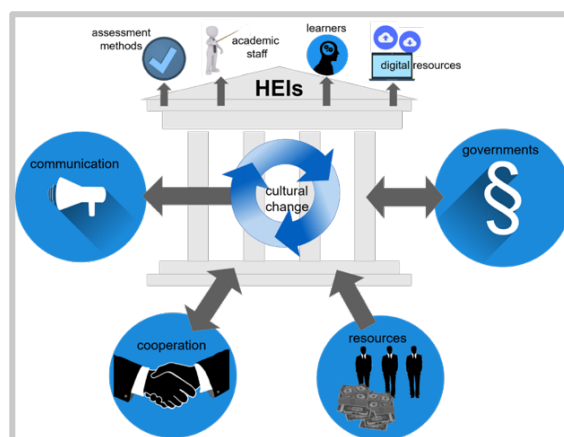
*3 - The "My-University" scenario:* This scenario describes HEIs as spaces where the elements of choices enlarge, and students can build their own curricula based on their personal interests. The curriculum of academic programs in this scenario would move from a fully predefined and 'up-front' given structure to a more flexible, personalized and participatory model in which students actively

cooperate with professors/ teachers/ advisors in curriculum building of HE programs.

*4 - The lifelong higher learning scenario:* In this scenario, seamless lifelong higher learning would be as important as initial higher education. Learners in the workplace would be the main type of student, choosing their portfolio of modules according to their personal skill needs and competence demands with high autonomy throughout their lifetime. Institutions thus would offer micro-credentials, which students assemble individually based on their own interests. Recognition of prior study achievements and practical experience would enable permeable shifting between different providers, which offer to bundle prior learning experience into larger certifications.

## V. Recommendations for leaders

Throughout the Delphi, survey the international expert panel was asked to comment on the strategies needed to change higher education. Leadership has been marked as crucial. A list of nine recommendations has been collected, which ranges from culture change within higher education institutions to communication, collaboration alliances, resource management and creating digital awareness.





## Table of Contents

<b>KEY FINDINGS</b>	<b>3</b>
<b>1. INTRODUCTION: THE FUTURE SKILL INTERNATIONAL DELPHI SURVEY</b>	<b>8</b>
1.1 INTRODUCTION TO THE FIELD OF FUTURE SKILL RESEARCH	8
1.2 METHODOLOGICAL DESIGN AND RESEARCH CONTEXT OF THE DELPHI STUDY	11
<b>2. RESEARCH DESIGN OF THE DELPHI SURVEY</b>	<b>13</b>
2.1 INTRODUCTION TO THE DELPHI METHOD	13
2.2 SURVEY DESIGN	14
2.2.1 SURVEY RESPONDENTS & EXPERTS PANEL DESIGN	14
2.2.2 QUESTIONNAIRES: RELEVANCE AND TIME OF ADOPTION	16
<b>3. FUTURE SKILLS</b>	<b>20</b>
3.1 A THREEFOLD MODEL OF FUTURE SKILLS	20
3.2 WHAT DRIVES FUTURE SKILL DEVELOPMENT: TWO KEY TRENDS	24
3.3 THE 16 FUTURE SKILLS PROFILES	26
3.3.1 SUBJECT-DEVELOPMENT RELATED SKILLS	30
3.3.2 OBJECT-RELATED SKILLS	31
3.3.3 ORGANIZATION-RELATED SKILLS	32
<b>4. FUTURE LEARNING</b>	<b>34</b>
4.1 STRUCTURAL ASPECTS OF FUTURE LEARNING	34
4.2 PEDAGOGY OF FUTURE LEARNING	35
<b>5. FUTURE HIGHER EDUCATION: KEY DRIVERS OF CHANGE</b>	<b>39</b>
5.1 WHAT SHAPES THE FUTURE FOR HIGHER EDUCATION?	39
5.2 FOUR PILLARS OF CHANGE	41
<b>6. FUTURE HIGHER EDUCATION: FOUR SCENARIOS</b>	<b>48</b>
6.1 THE 'FUTURE SKILL' UNIVERSITY SCENARIO	50
6.2 THE NETWORKED, MULTI-INSTITUTIONAL STUDY SCENARIO	51

<b>6.3 THE “MY-UNIVERSITY” SCENARIO</b>	<b>52</b>
<b>6.4 THE LIFELONG HIGHER LEARNING SCENARIO</b>	<b>54</b>
<b>7. MAKING IT HAPPEN: NINE RECOMMENDATIONS FOR THE FUTURE SKILLS STRATEGY IN HIGHER EDUCATION</b>	<b>57</b>
<b>8. CONCLUSIONS AND FINAL REMARKS</b>	<b>62</b>
<b>9. LITERATURE</b>	<b>65</b>
<b>ANNEX A</b>	<b>67</b>
<b>ANNEX B</b>	<b>69</b>
<b>ANNEX C</b>	<b>69</b>

## 1. Introduction: The Future Skill International Delphi Survey

Research on future skills is the current hot topic of the day in management and organizational research. In times of global networked organizations, and steadily accelerating product cycles, the model of qualification for future jobs seems in question. The vast majority of employers surveyed for the “Future of Jobs Report” of the World Economic Forum (WEF 2018), released in 2018, expects that in short term, by 2022, the skills required to perform most jobs will have shifted significantly: “While these skill shifts are likely to play out differently across different industries and regions, globally, our respondents expect average *skills stability*—the proportion of core skills required to perform a job that will remain the same—to be about 58%, meaning an average shift of 42% in required workforce skills over the 2018–2022 period”. Can graduates really be prepared for the future through knowledge acquisition? Are we already having adequate concepts for competence development in higher education? Or is something new, something radical needed? Research on future skills becomes more prominent, either compiling lists of skills for broad purposes of how to live and work in 2030 (OECD, 2018) or analyzing job field related qualifications (Deming, 2017). However, the time is ripe to go a step further and conduct in-depth research.

### 1.1 Introduction to the Field of Future Skill Research

What plays out in the future depends on decisions taken today, which can critically narrow the room for maneuver over time. That is why it is important to factoring the long term into decision-making in higher education today. Starting point for research on future skills is an analysis of factors, which influence our lives, the way we work and live, learn and develop. On the one hand, we cannot predict what the future will look like, whereas, on the other hand we notice that changes are underway, and leave us with a changed environment demanding different behavior, and adaption to more complex situations in our lives and work contexts. An analysis of such changing factors is available in a multitude of volumes, in many forms, shapes and perspectives. The nature of such descriptions, studies and analyses is – as they are dealing with the future – naturally carrying a certain degree of vagueness, while being as precise as possible in order to capture aspects, which can be taken as factors of influence for the future: future ways of living, future ways of work, future ways of learning, etc. (e.g. OECD 2019, 2018, 2017a, 2017b). Analyzing the currently existing writings dealing with the question of which skills and abilities will be important for the future work life, at least two converging primary factors crystallize:

- Ever faster technological advancements and their penetration and infusion of all spheres of our lives, work and societies, leading to an excess of information and options. This can be compared to the point in time, when Gutenberg invented the printing machine for books, and for which our society is only starting to develop ways of coping with it.
- Increased global cooperation, exchange, and communication, which moves from being an option to being a necessary ingredient of every process of society, work and individual life.

Resulting from that, a number of connected changes can be observed, which we believe to be secondary effects, building on the foundations of the two prior ones:



- Resulting from the tectonic shifts in the structure of work and its development, a new demand for (higher) education study and learning pathways and qualification structures including certification and credentialing schemes will be needed. Educational institutions need to understand these forces in order to develop a changed vision of future education to inform their strategies.
- Fostered through these changes an ever-larger demand for higher educational attainment is induced evoking industrialized societies to turn into learning/ educational societies in which life risks primarily can be mitigated through education.
- And lastly, a changing nature of the very essence of what learning (in school) and studying (in higher education) is aiming at can be observed, leading to a new ‘lead-orientation’ for concepts like knowledge – shifting from static knowing to knowing & reflection in action in complex and open situations.

It is important to note that no cause-effect model can be applied to these developments. In order to find reference models which are capable of capturing the intertwined and networked nature of these developments with factors mutually influencing each other, we turned to eco-systems theory and cybernetics. The dynamic nature of these approaches able to deal with and describe system dependencies provides grounds for theoretical description of reality. The eco-systemic approach is based on the assumption that changes and developments in one system are causing effects in a connected system. Building on this approach, combining it with an education science point of view, as well as with a sociological perspective, our research is rooted in the assumption that there are ongoing changes within the structure, nature, and profile of the abilities and skills. Individuals will need these skills for their professional lives in order to cope with the demands and requirements of their respective work contexts and tasks. In our research we found, that these changing skill requirements can be described and analyzed.

Notably, policy and especially research, pays increasing attention to analyzing in-depth changes and trends for the future world of work and for future job markets (OECD 2018a, 2018b, WEF 2018, Playfoot & Hall 2009). However, most approaches fall short of two perspectives, which we call the “iceberg phenomenon” and the “future education gap”:

The first blind spot is the iceberg phenomenon: The iceberg phenomenon of future skill research refers to the fact that future skill research is often focusing on technological change (World Economic Forum 2018, Hirsch-Kreinsen 2016, CEDEFOP 2012, Deloitte 2018, PwC 2018, McKinsey & Company 2018, Balliester & Adam 2018), which is only one side of the coin. Our research shows that this is just the tip of the iceberg. Only very few studies try to elicit changes, which go along with it and which lie underneath the surface of the iceberg: dealing with future work concepts, the tectonic shifts throughout an entire business or public organizations, the way collaboration is organized, and the impact it has on organization culture, new leadership concepts, more decentralized, smaller units, and a need to organize shared creativity and shared cognition in a global setting.

The second blind spot (future education gap) is the future skills education concepts gap, which refers to a lack of research with regards to the demand and shape of future higher education concepts, which meet the need for future skills. It is still unknown how higher education institutions can organize their academic programs in a way that they specifically are sensitive to supporting the development of future skills for their future graduates. Although many promising attempts and pilot trials are underway, there is no overarching forum for discussing possible future higher education and its institutions.

Both issues, the iceberg phenomenon of future skill research and the future education gap are predominant issues in future skill research today. In order to overcome this shortfall and to be able to research the articulation, extent, nature and contexts of such future skills – and not limited to digital skills but future skills with a broader scope, we designed a threefold long-term research project, starting in 2015, called “Future skills – future learning and future higher education”.<sup>1</sup> The research focus is on identifying future skills in a broad and holistic sense, incorporating digital skills but going beyond them, and determining which changes are caused in work environments leading to these new skill demands. Moreover, we asked how higher education institutions would have to reorganize their academic programs in order to support development of such future skills for future graduates.

There are complex feedback loops between new technologies, job creation, education organizations attempts to prepare individuals for present and future jobs, and their skill development. New technologies can drive business growth, job creation, and demand for specialist skills but they can also displace entire roles when certain tasks become obsolete or automated. Well-developed links between higher education institutions and labor markets in order to share and exchange information about these often short-term developments, do not exist at large scale.<sup>2</sup> Skill gaps—both, among workers and among the leadership of organizations—can speed up the trends towards automation in some cases but can also pose barriers to the adoption of new technologies and therefore impede business growth.

Part 1 of the research initiative is about identification of innovative and future, advanced organisations. We identified organizations, which we call for the purpose of this research study ‘future organizations’ due to their advanced thinking on learning and competence development. In part 2 of the research, we analyzed the nature of these competence concepts and the competence demands of these organisations on a deep level through in-depth interviews and were able to model a set of sixteen competence profiles which we refer to as ‘future skills’. Each competence profile contains an array of a number subcompetences. The data led us to be able to identify a three-dimensional competence frame around the 16 competence profiles, so that they can be categorized according the three future skill dimensions. In order to validate our approach and findings, and to determine the impact the demand of future skills has on higher education, we designed – in part 3 – the presented Delphi study on the basis of our findings, drawing on the assessments and opinions of almost 50 experts from all over the world.

The Delphi study involves experts into reasoning and evaluation of statements and scenarios about future higher education. The experts were asked to engage into reflection and evaluation within three areas, which were identified as important for future higher education: (1) drivers of change shaping future higher education, (2) scenarios of future higher education, and (3) future skills. For each of the areas we were interested in the degree of relevance of the respective issues, as well as in the experts’ opinion about when they would gain relevance.

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<sup>1</sup> Notably the first European country, which had a national higher education strategy mentioning the term “Future Skills” was Ireland (<http://hea.ie/assets/uploads/2017/06/National-Strategy-for-Higher-Education-2030.pdf>).

<sup>2</sup> Good practices for frameworks of university business cooperation have been analyzed in the frame of the HAPHE Project (<http://haphe.eurashe.eu>)

## 1.2 Methodological Design and Research Context of the Delphi Study

Since 2015, we have been conducting research to shed some light on the future of skill demand. We focus our efforts on identifying what we (and others) refer to as future skills, as well as how we can support their development. As has been demonstrated by other studies, too<sup>3</sup>, research in this area is of vital importance as future graduates need to adapt to an increasingly changing and complexity-gaining environment that demands agility and innovativeness. To address this complex, intertwined field systematically, we pose three questions within three different, but interrelated areas:

- Future skills: Which skills are necessary for future employees? Which skills are/ will be necessary to shape the future and society in a sustainable way?
- Future learning concepts: How can organizations and firms support the development of future skills (learning and management approaches)?
- Future higher education: How can we design higher education concepts such that they support the development of future skills?

We approach these questions from an education theoretical point of view, combining it with a socioecological perspective on competences. Before conducting the Delphi on which we will elaborate in more detail here, we want to provide a brief overview on two past projects that we carried out in advance of the current research effort.

We started the first project in June 2015. In this first step, we identified and analyzed competence concepts in more than 120 German organizations.<sup>4</sup> Through an expert screening and analysis, we were able to identify main dimensions of action competence within the overall concepts submitted by the participating organizations. According to the expert's opinion, about 20 organizations proved to have very advanced, developed, and elaborated conceptions and documented approaches for competence development with their employees and advanced learning architectures. Within these documents, experts also found evidence of skill and competence descriptions, which are seen as important and essential for individuals' and organizations' performances in future markets and activities.

The research team chose 17 organizations from this group of advanced organizations to conduct further research into finding dimensions and structures of future skills from the perspectives of advanced organizations. To gain further insights into the specific skill set, organizational approaches to promote them as well as for the purpose of identifying drivers leading to the changed skill demand, we interviewed 17 representatives from such advanced organizations. These 17 interviews were conducted with eleven organizations from the set of the advanced organizations identified beforehand. The interviews resulted in more than 700 minutes of interview material addressing the above questions. Based on the material, two researchers coded all interviews independently using the inductive coding technique (Thomas, 2006) and the software MAX QDA (VERBI Software, 2017). After coding, passages lacking unanimity were discussed among the researchers to gain inter-operator reliability in coding.

As a result, we have obtained

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<sup>3</sup> See for instance Deming (2017), Noweski, Scheer, Büttner, von Thienen, Erdmann, and Meinel (2012), OECD (2017).

<sup>4</sup> These had been identified through a tender offer – the Dual Partner Award. To win this award, organizations were asked to provide details about their competence models and trainings offered to promote their employees' skill formation. Winners were then invited to participate in a qualitative interview study.

- a) a set of future skills,
- b) insights into dimensions of change in organizations through digital and networked global collaboration processes,
- c) and have specified a number of scenarios of future higher education.

The international Delphi study we are reporting on here is based on these results. Having gained insights into future skills, cultural and organizational changes, as well as organizations' reactions to these new demands, the Delphi's main intention was fourfold:

1. To gain insights into the main drivers of change and factors resulting from these drivers,
2. to capture the likelihood for different scenarios about the organization of higher education in the future, about
3. important skills for future graduates, and
4. learning design and study experiences of future higher education.

In round one of the Delphi, we engaged the experts into clarifying concepts and asking for the importance of each concept presented (see Delphi Questionnaire in Annex B).

In round two of the Delphi, experts were asked about their estimations on potential time of adoption of the aforementioned topics (see Delphi Questionnaire in Annex C).

Before we present the Delphi's setup and provide details on our set of international expert respondents in this report, we describe the survey design and methodology.

## 2. Research Design of the Delphi Survey

Having a wealth of baseline information through the previously conducted qualitative studies, the Delphi survey methodology has been chosen in order to get informed consensus about possible future scenarios for higher education institutions. The Delphi experts panel has been chosen carefully in order to cover geographic differences, respect gender balance, and allow for a maximum of differentiation of work-related and higher education contexts in order to capture different views. The following section provides detailed insights into the methodology and the experts panel design.

### 2.1 Introduction to the Delphi Method

Using the Delphi technique allows to structure individuals' anonymous communication to achieve consensus among a group of identified experts (Linstone & Turoff, 1975). It is argued that this anonymity reduces certain biases as it “eliminates committee activity among the experts altogether and replaces it with a carefully designed program of sequential individual interrogations (usually best conducted by questionnaires) interspersed with information and opinion feedback.” (Helmer, 1967, p. 8). The goal of Delphi surveys is to forecast future events based on observation of certain past phenomena that the Delphi inquirer has carefully analyzed and condensed into guesses about the future (Brown, 1968). According to Helmer – one of the developers of the method – the Delphi is one technique that replaces the former crystal ball gazing and fortune telling by “a sober and craftsman like analysis of the opportunities of the future” (1967, p. 7). The first step consists in identifying a panel of experts (Brown, 1968; Helmer, 1967). For the purpose of the current study, we identified 53 international experts from the field of higher education and higher learning to whom we administered the questionnaire by means of an online survey.<sup>5</sup> After identification, participants need to be briefed on the topic and on the Delphi technique itself. Subsequently, experts are invited to participate in two or more rounds of the survey. Between two rounds, the researcher(s) analyze the responses and set up a feedback in terms of an anonymized summary of the experts' answers from the previous round. Usually, experts are then encouraged to revise their answers, comparing them to the answers given by the other panel experts so as to reach consensus among the group. After consensus or at least a majority-consensus has been reached, the second round can be initiated, focusing on a different aspect of the topic that builds on the consensus from the first round. In our case, experts in the first round were asked for instance, to rate the likelihood of four potential future scenarios for higher education. Between the first and the second round, we then calculated likelihood means for each of the scenarios, also taking into consideration the comments of respondents on the scenarios that were accounted for in terms of statement modifications for the second round. In the second round, respondents were then presented with the adjusted scenario options and asked to estimate how long it would take for higher education to achieve this new hypothesized state.

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<sup>5</sup> For a detailed description of our expert panel, see chapter 3.1.

After the ultimate round, the data can then be analyzed calculating mean or median scores to shed some light on how the future in a certain field might look like according to the field's experts (Rowe & Wright, 1999).

Below, we elucidate on the Delphi study on future skills, future learning, and future higher education that we conducted in summer/autumn this year.

## 2.2 Survey Design

Following, we will focus on two aspects: Firstly, we will take a careful look at our international expert sample (their professional as well as national backgrounds, and their fields of interest); secondly, a brief overview on the topics and structure of the two rounds of the Delphi survey will be provided.

### 2.2.1 Survey Respondents & Experts Panel Design

We invited 53 international experts from different organizations and institutions. They worked within higher education institutions, as researchers in the field of pedagogy, networks concerned with learning and skill formation topics, the digitalization of higher education or within NGOs. Table 1 gives a short overview on the distribution between practitioners and representatives of higher education institutions as well as their respective position in round 1, table 2 summarizes the same data for round 2.

Table 1: *Distribution of expert participants according to their professional field in round 1*

Position	Practitioners	Higher Education
Experts	1	3
E-learning professionals	1	3
Lecturer	0	9
Researchers	1	14
Institutional Leader	11	11

*Note.* N = 46. The totals exceed 46, as some of the participants fell into more than one category

Table 2: *Distribution of expert participants according to their professional field in round 2*

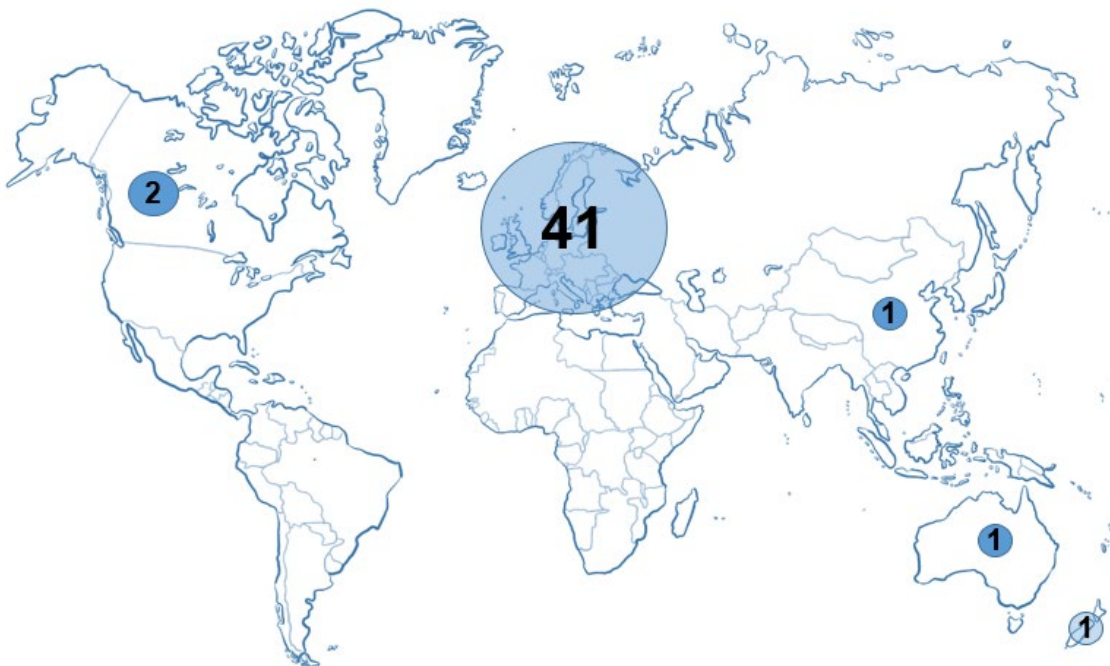
Function	Practitioner	Higher Education
Experts	2	3
E-learning professionals	0	3
Lecturer	0	8
Researchers	2	14
Institutional Leader	6	10

*Note.* N = 38. The totals exceed 38, as some of the participants fell into more than one category



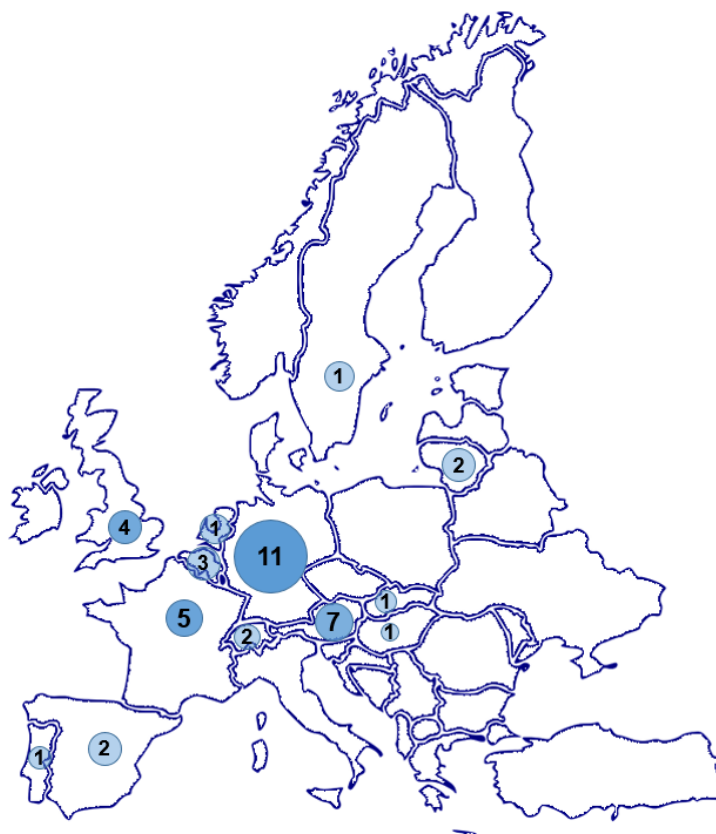
It was important to us, to consider the perspectives of both, representatives from higher education institutions as well as from consultants and practitioners from the economy. Further, we paid close attention to the fact that within the two sub-samples, people occupying different positions were included in order to capture the plurality of opinions on the topics surrounding the future of learning, skills and higher education.

Almost 50 international experts participated in round 1, representing 17 different countries (Australia, Austria, Belgium, Canada, France, Germany, China, Italy, Lithuania, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, and the United Kingdom). As can be seen in figure 1, the sample predominantly represents European views, however, also coming from North America, Asia and Oceania, with Europe representing 89% of the overall respondents.



*Figure 1. Residence of the Delphi participants (world-view)*

As illustrated by Figure 2, most of the European respondents came from Germany (27%), followed by Austria (17%), and France (12%). Gender-wise, the sample consisted of 30 male and 16 female respondents in the first round, as compared to 14 female and 26 male participants in round 2, leading to a slightly lower overall participation in the second round (-17%). The round two sample consisted of participants from 14 different countries with the majority of participants still coming from Europe. This allowed bridging geographical boundaries, thus considering the expertise of an international sample, which suggests that the results obtained in the survey extend beyond national boundaries and reveal general trends within higher education that might also be relevant especially to other European countries or maybe even globally.



*Figure 2. Residence of the European Delphi participants*

To reduce response bias, participants remained anonymous to each other during the phase of data collection. Only after completion of both rounds, we asked the respondents for permission to name them as part of our international expert board, thereby acknowledging their participation in our publication (see table A in the Annex for those who gave their permission).

### 2.2.2 Questionnaires: Relevance and Time of Adoption

The Future Skills Delphi consisted of two rounds, the second administered four weeks after the first. Both rounds were mainly focusing on asking experts to clarify concepts, definitions, terminology and rating importance (round 1) and of time to adoption in the field of future skills (round 2).

#### **Delphi Survey Round I**

In the first round, respondents were presented with a 38-item questionnaire. The questionnaire was split into two different parts of which the first one dealt with a) driving factors and their impact on b) possible scenarios for future higher education (upper left part of figure 3), whereas the second part focused on gaining a clearer picture regarding the importance and current

development of previously identified so-called “future skills” (Ehlers, forthcoming)<sup>6</sup> (lower left part of figure 3). The questionnaire contained both closed and open-ended questions, which allowed to generate a quantitative “snapshot” of overall sample tendencies, while at the same time gathering respondents’ comments and suggestions for reformulations. The first round was open from September 7 until October 3, 2018. After the data collection phase, respondents’ qualitative answers and comments were analyzed in order to re-formulate statements and items on future skills and future higher education.

## **Delphi Survey Round II**

With the validated and refined statements, the second questionnaire for the Delphi was set up (right part of figure 3). Hence, the second questionnaire was not a mere replication of the first questionnaire, this time with a shifted focus towards the speed of adoption but presented validated and refined statements. Moreover, the first round yielded an interesting result showing a gap between the importance of future skills on the one hand side and the ability and readiness of higher education institutions to provide learning environments in order to help students to develop them. In the second questionnaire, we provided the results from these items as a graph, illustrating both these factors for each skill, and asking respondents for their opinion on what would need to be done to further promote the skills. The adapted questionnaire for round 2 turned out to be slightly shorter than the first one, comprising 21 statements only. Data for the second round were gathered from October 10 until October 20, 2018.

In general: we did not expect and did not look for unanimous agreement on the shape of future higher education. Otherwise, the object would not be in question. Naturally, there must be different points of view about how the future will look like.

In our study, we looked for numbered ratings as well as for qualitative commenting of the issues presented. The qualitative comments allowed for validation of the formulation of the different issues. The numbered ratings allowed us to determine the degree of convergence of experts views. High convergence rates express a high consensus in views of experts. The rating of importance of driving factors and relevance of scenarios as well as future skills and formulations of future learning resulted into high convergence rates, usually above 85% – meaning that more than eight out of ten experts were agreeing or strongly agreeing to an item presented. However, it is important to note that a small room of alternative views on issues remained, which did not converge with the presented items. While we were surprised that there seems to be a broadly accepted direction of development and a clear consensus on its underlying factors, we still would like to stress that such a broad issue like the future of higher education can never be without alternatives, neither in the future, nor in the present.

In terms of adoption time, experts were more divided as regards their views. We therefore used an accumulated logic of analysis. This method allows showing the consensus of the overall share of experts for a certain adoption time.

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<sup>6</sup>As stated earlier, Ehlers conducted in-depth interviews with representatives from agile, advanced organizations prior to the Delphi, who reported on skills necessary for future graduates and employees (forthcoming).

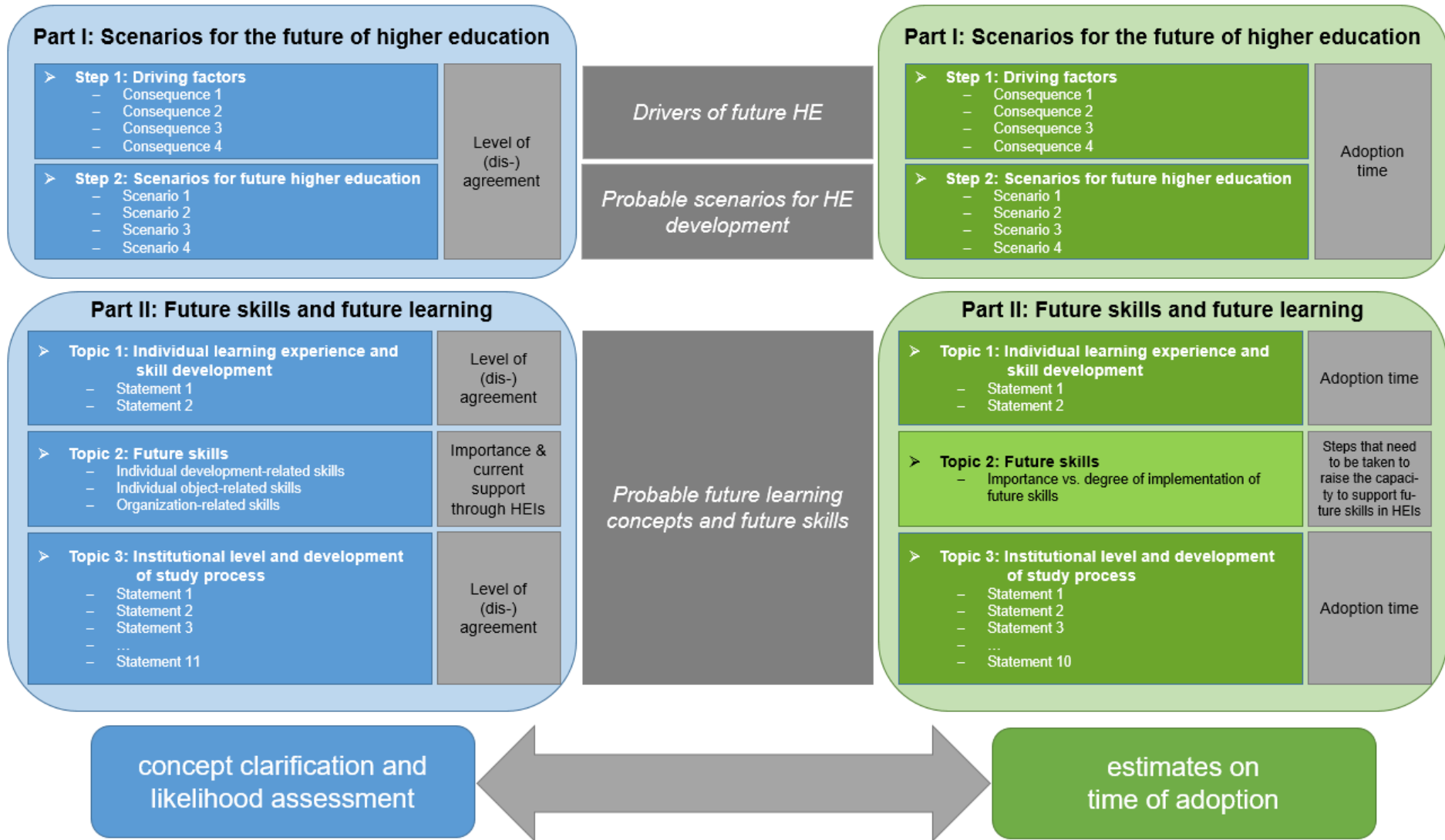


Figure 3. Delphi research design and questionnaire structure for round 1 (left-side) and round 2 (right-side)

# Future Skills – The Future of Learning and Higher Education

## International Delphi Survey

## Info Graph: What Drives the Future of Higher Education? Four Pillars of Change and Their Time of Adoption

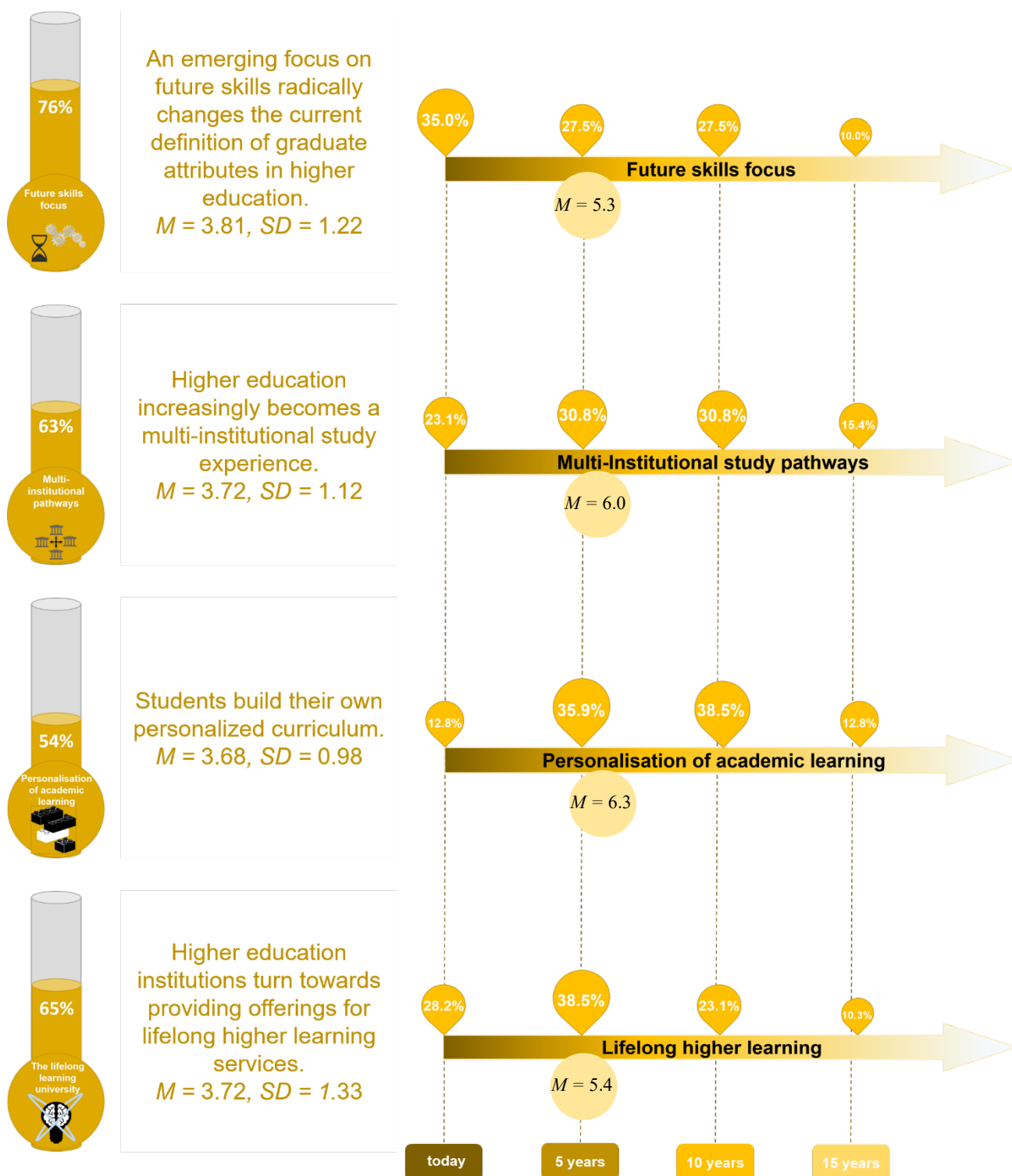


Figure 4. Overview on agreement levels and adoption times of the four pillars of change in future higher education ( $N_{Round1} = 46$ ;  $N_{Round2} = 39$ )

### 3. Future Skills

In our research on future skills and future higher education more than 20 individual in-depth interviews with HR professionals, development & change experts in advanced organisations, as well as with students were conducted and more than 10 hours of qualitative data material collected (Ehlers 2019, forthcoming). The interview data were qualitatively analyzed through semantic content analysis using MaxQDA software tools. An important focus was put on participants views of the abilities, the processes, the strategies, skills and competences which employees needed and will need in the future in order to cope and productively deal, as well as further develop the increasingly faster changing organizational reality. Apart from the analysis of the actual skills needed to cope with future demands in organisations, we put a second focus of attention to the reconstruction of the underlying structure of argumentation of interview participants in order to gain insight into the constitution of factors lying behind the future skill concept.

#### 3.1 A Threefold Model of Future Skills

The analysis resulted in a reconstruction of factors which are underlying future skills and reveals insights into the form and importance of learning in today's and future professional work environments of advanced "future" organizations, as well as a reconstruction of those specific individual abilities and skills which will be necessary to deal with challenges in professional future work environments. We found that the inherent structure of future skills could be classified according to its inherent inner structure into three dimensions: subject – object – and environment. The three dimensions allow to allocate skills according to their relation to subject – object – world. All three dimensions are interrelated. We are introducing this threefold distinction (fig. XYZ) because any kind of ability or action can either be an expression to shape

- an individuals' relation to itself in past present or future (time dimension)
- an individuals' relation to a certain thing or object (object dimension)
- an individuals' relation to somebody else or a group in the world (social dimension)

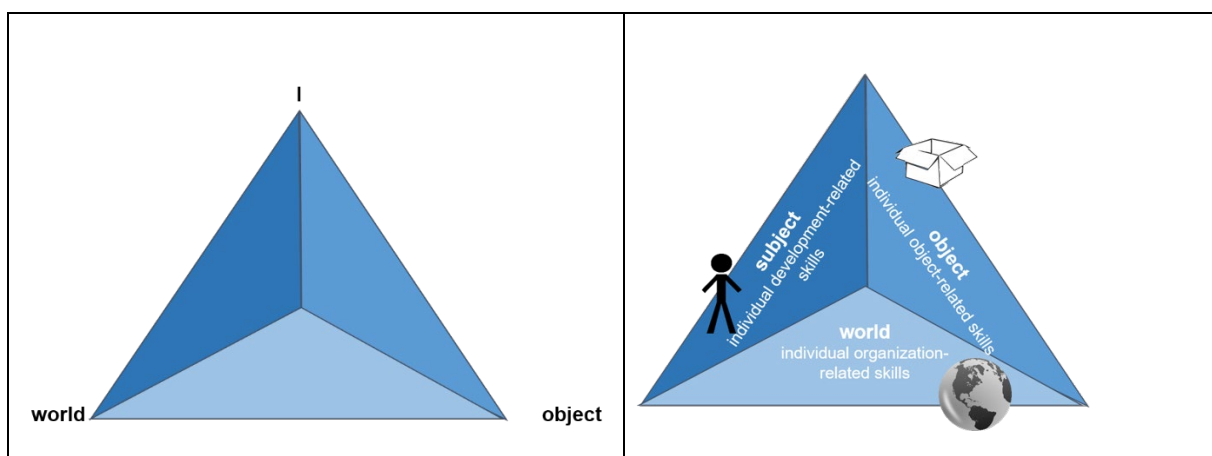


Figure 5. The threefold future skills model



This threefold distinction goes back to Meder (2007, also Roth 1971) which are presenting a foundational, constitutive structure for education as a threefold relation.

It thus allows to differentiate skills which are related to individual perception, individual reflection and development of awareness (subject related) and skills which are related to things which can be experiences (objects), and thirdly related to the social world (world). The three dimension allow to describe more precisely which we refer to future skills instead of just calling them skills. In all of the three dimensions shifts are going on. The interview data reveal a clear change in nature of what is demanded in the future in comparison to the past and in parts the present.

1. Subject related individual skills: Whereas in the past individuals could rely on following requirements, the future will demand more self-organization instead.
2. Object related individual skills: Whereas in the past individuals could rely on applying knowledge, methods and tools, the future will demand original creative development of new knowledge, methods and tools.
3. World/ organizational related skills: Whereas in the past organisations were organized and management according to clear structures, the future will demand fluid, enabling, agile cultures.

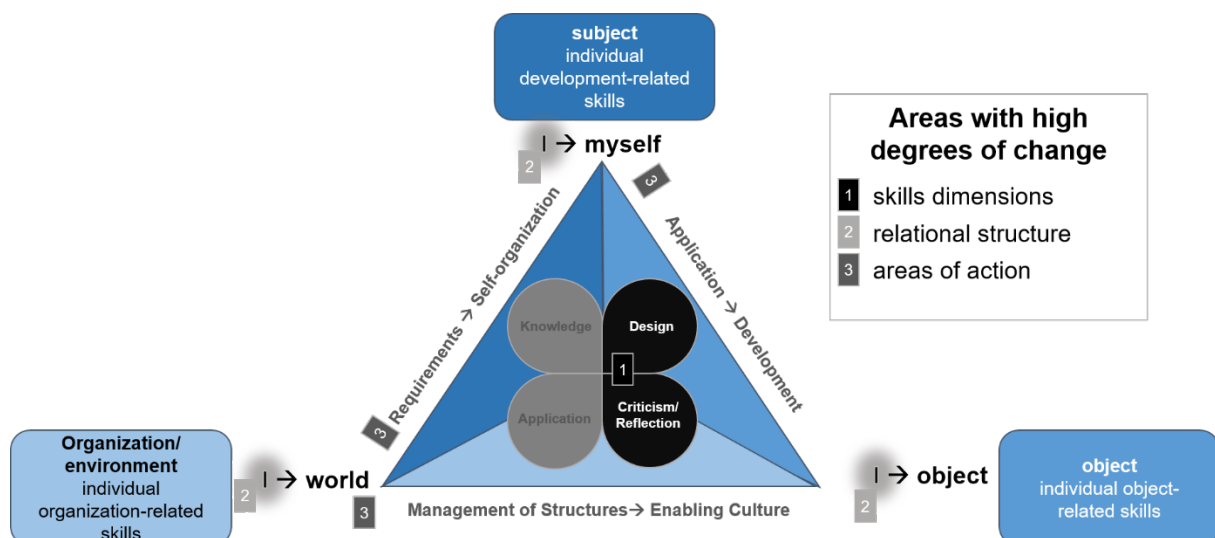


Figure 6. Linking the Structural Education Model and the Skills Model as Conceptual Framework for the Future Skills Model

The figure shows that shifts take place in all three dimensions (third area of change). In addition, data reveal shifts in different fields as well by emphasizing the greater importance of individually responsibility for their own development, competence management and autonomous navigation through an ever faster changing environment. Whereas in the past external structures were the scaffold which provided guidance to individuals, external scaffolding will be less perceivable in the future. Thus, individuals will have a greater role to be navigators themselves (second area of change – relational structure). And, finally, the skills dimensions which will be important in the future are also changing. Although the term skill is referring to a compound of elements (e.g. knowledge, skills, attitudes), the data emphasize certain elements with more importance of the future and certain elements which will be

providing basic foundation but will not be sufficient for the future. The figure shows that knowledge and application of knowledge will be such foundational elements which will however, in the future not be sufficient for successful performance. Much more importance were given to the two elements “design” and criticism/ reflection” for future performance.

All three dimensions interact with each other and are not sole expressions of isolated skill domains. Subjective aspects influence outlook on objective aspects as well as social aspects impact subjective and objective aspects. The presented future skill model is thus going beyond a static model of listing a set of defined skills. It is secondly going far beyond digital or technical skills which will no doubt be important but represent just one ingredient. Their values lie in the personal development of dispositions to act self-organized in the respectively described domain.

In summary, the future skill model is capable of describing the wide array of future skills in a clearly structure and well described set of dimensions:

1. The first Future Skill dimension is the subjective dimension of futures skills profiles. It is relating to an individuals’ subjective, personal abilities to learn, adapt and develop in order to improve their opportunities to productively participate in the workforce of tomorrow, actively shape the future working environment and involve themselves into forming societies to cope with future challenges. It contains seven future skill profiles.
2. The second Future Skill Dimension is relating to an individual’s ability to act self-organized in relation to an object, a task or a certain subject matter related issue. It is emphasizing a new approach which is rooted into the current understanding of knowledge but is suggestion to take knowledge several steps up the ladder, connect it to motivation, values and purpose and impregnate it with the disposition to act self-organized in the knowledge domain in question. It is not just a quest for more knowledge but for dealing with knowledge in a different way which is resulting into professionalism and not into knowledge expertise.
3. The third Future Skill Dimension is relating to an individual’s ability to act self-organized in relation to its social environment, the society and organizational environment. It is emphasizing the individuals dual role as the curator of its social portfolio of membership in several organizational spheres and at the same time having the role of rethinking organizational spaces and creating organizational structures anew to make it future proof. It contains an array of five skill profiles.

Table 3: *Future skill profiles (each containing a subset of skills)*

Subject	Object	Social
<b>Autonomy (self-determination):</b> capacity to make an informed, uncoerced decision and act accordingly.	<b>Agility (systems competence):</b> ability to orient oneself in fast changing contexts, constantly changing objects.	<b>Sense-making:</b> ability to identify with and make sense of given organizational rules and values for one's own life and work.
<b>Self-initiative (initiative and performance competence):</b> individual ability to take an active and self-starting approach to work goals and tasks.	<b>Creativity (innovation competence):</b> to be able to deal with task in a new, unforeseen way.	<b>Future mindset (future and design competence):</b> ability to productively develop an organizations' context, continuously learn and develop one's skills and to be open for new and unknown challenges within a given organizational context.
<b>Self-management (decision competence):</b> ability to lead and regulate oneself to decide in a self-responsible way.	<b>Digital literacy:</b> ability to utilize digital technology in a creative way for learning, working, collaboration.	<b>Cooperation competence:</b> ability to cooperate in teams and have social and intercultural skills
<b>Need/ motivation for achievement (initiative and performance competence):</b> individual's desire for significant accomplishment, mastering of skills, control, or high standards.		<b>Communication competence:</b> ability to actively create dialogue, achieve consensus and criticize.
<b>Personal agility (self-competence):</b> positive attitude, resilience and openness to changes, being comfortable in ambiguous and changing situations.		
<b>Autonomous learning competence (learning literacy):</b> ability to continuously adapt through learning, know learning methods, evaluate own progress, ability to learn motivated.		
<b>Self-efficacy:</b> one's own conviction to be able to act successfully on a given task.		
<b>Tolerance for ambiguity (ambiguity competence):</b> ability to deal with uncertainty and in different roles.		
<b>Ability to reflect (reflective competence):</b> ability to critically analyze made experiences and learn for future contexts.		

### 3.2 What drives future skill development: Two key trends

The two main orientations for future skills have been isolated through the study and the experts' judgement. We call them the main foundations for the future skill concept. They point to the essence of the future skills context: constant adoption through learning and uncertainty as inherent trait of professional contexts of the future – and as inherent characteristic for skills being understood as dispositions to act in future unknown contexts rather than reproduceable knowledge.

“The greatest challenge students need to be prepared for through higher education institutions is be the continuous need for ‘adaption through learning’ in changing work environments.”

“The ability to deal with uncertainty is the most important skill in current and future work environments.”

Both statements receive high levels of agreement, supported through qualitative commenting of experts and are also seen as relevant today or within the next 5 years by the majority of experts. 89,2% of the respondents indicated agreement with our first proposition that the greatest challenge students would need to be prepared for through HEIs would be the constant need for ‘adaption through learning’ in constantly changing future work environments ( $M = 4.17$ ,  $SD = 0.81$ ,  $A_{Adaption(strongly\ agree)} = 37.0\%$ ,  $A_{Adaption(agree)} = 52.2\%^7$ ).

In their discussion, experts stressed that the consequence of this development would be an increase in importance in shifting focus from teaching to learning and from teacher to student centered approaches in order to support students not as mere “receivers” of skills, but as individual productive learners, autonomously responsible for their own development.

“Indeed, and as they [the students] are increasingly actors in their own development, they will need the capacity to steer their own learning and professional experiences.”

Similarly, other respondents stressed the fact that this situation and demands will be especially challenging for students, thus arguing for strong support from HEIs.

Issues were also brought up on the point that individuals would need to deal with “constant changes” in the work environment - rather it was suggested that changes would most probably occur continuously and intermittently.

The second statement suggested that the ability to successfully deal with uncertainty would become the most important skill in future work environments. As indicated by figure 7, the experts' opinion was largely overall in agreement with this position ( $M = 3.73$ ,  $SD = 1.10$ ,  $A_{Uncertainty(strongly\ agree)} = 26.7\%$ ,  $A_{Uncertainty(agree)} = 40.0\%^8$ ). The majority of elaborative comments stressed that experts perceived this skill to be or to become increasingly important,

<sup>7</sup>  $A_{Adaption(strongly\ agree)}$  indexes the percentage of respondents, who strongly agreed with the statement, whereas  $A_{Adaption(agree)}$  shows the percentage of the sample that expressed agreement.

<sup>8</sup>  $A_{Uncertainty(strongly\ agree)}$  indexes the percentage of respondents, who strongly agreed with the statement, whereas  $A_{Uncertainty(agree)}$  shows the percentage of the sample that expressed agreement.

accompanying other future skills in their rise to importance. The constructive reasoning about how to deal with uncertainty as educators is resulting into the question how the preparation of learners to deal with uncertainty can be supported, and if that would need a generic approach of if it is a rather overarching skill which is not context bound.

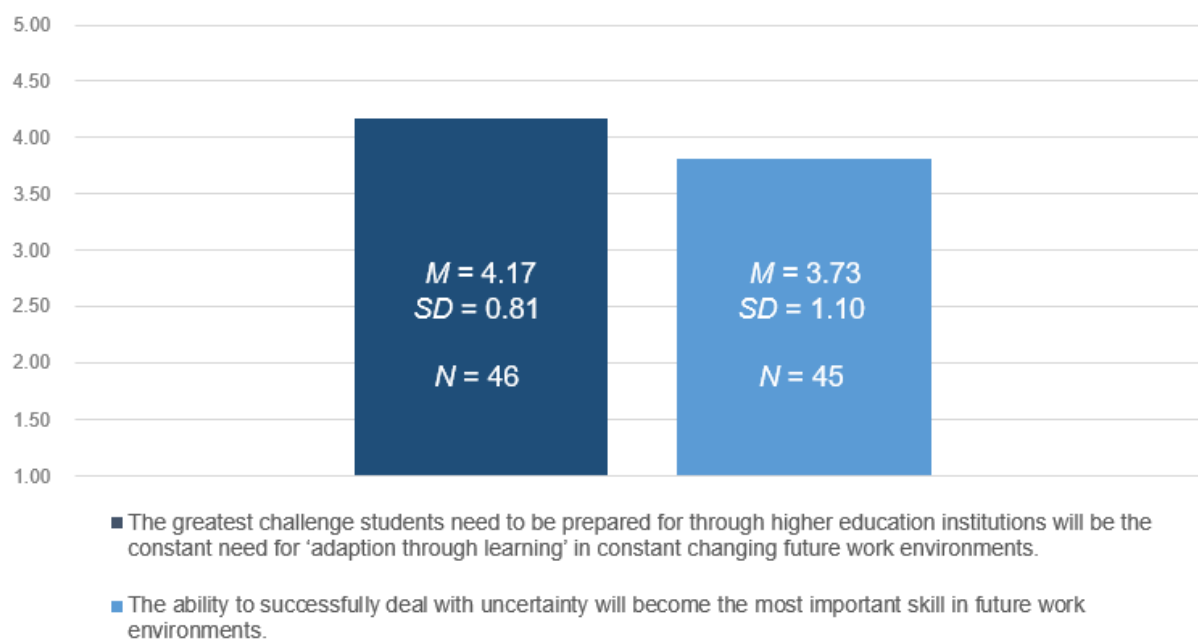


Figure 7 Individual learning experience and skill development

Another respondent expressed that this skill would not be new, but instead society would be more aware of the concept and its importance:

“ It has been always important to have the ability to deal with uncertainty, probably it was called ‘entrepreneurship’, ‘thinking out-of-the-box’ or ‘visionary’ in different times of history. In the future workplace, it would be always needed so as the primitive society when male went to hunt, and female went to taste the fruit. Uncertainty is always part of our human history. Risk society is not just a new concept, but our social scientists formulate it better for us to review this concept.”

In summary, the international expert board of this Delphi survey views both, the ability to continuously adapt through learning and the capacity to deal with uncertain environments as major challenges. On the one hand, HEIs are challenged, because they need to find ways how to successfully equip their graduates with these skills, but also, and maybe even more importantly, the students, on the other hand, become increasingly self-responsible for their skills and learning.

Whereas we saw in the previous chapter that HEIs will probably take about ten years to restructure and move in the direction of the scenarios outlined, the individual learning experience and a changed focus for students’ skill development are assumed to be much more

relevant already. This was specifically highlighted by one of the experts, stating that “the need is stronger than the ability of the higher education sector to adapt to it”. As can be seen from figure 18, more than half of the sample indicated that the ability to continuously adapt through learning in changing work environments would already be highly relevant. For a third of the participants, this trend will become relevant short-term.



Figure 8. Estimated timeframe for the increasing importance of student's abilities to continuously adapt through learning (N = 46)

More than 60% suggested that the ability to deal with uncertainty in current and future work environments would be highly relevant already; slightly less than a third evaluated this to become relevant within the next five years.



Figure 9. Estimated timeframe for the increasing importance of student's abilities to dealing with uncertainty (N = 45).

Among the respondents suggesting rather longer adoption times, the main reason was that they saw the importance of the respective ability already but doubted that HEIs would be ready yet to equip their students with them.

In addition to the statements about nature and shape of future challenges and resulting demands, our research resulted into a model of future skills which contains 16 skill profiles. Experts were asked to rate them as for their relevance, assess the scope and wording and also evaluate from their view how ready today's HEI are to support learners in their development.

### 3.3 The 16 future skills profiles

Research resulted into 16 skill profiles which can be grouped into three categories of future skills. The three groups are defined as follows:



1. The subject-related dimension: These are skills which are directed to the individual itself and enable individuals to deal with themselves and their own development.
2. The object-related dimension: These are skills which enable individuals to deal with a subject matter related object or task
3. The organization-related dimension: These are skills which enable individuals to deal with their social environment – in the case of future skill related research to the organization in which they act.

Figure 22 shows the entire set of skill profiles within the three groups. Each skill profile contains a number of subskills which are viewed as important within this skill area.

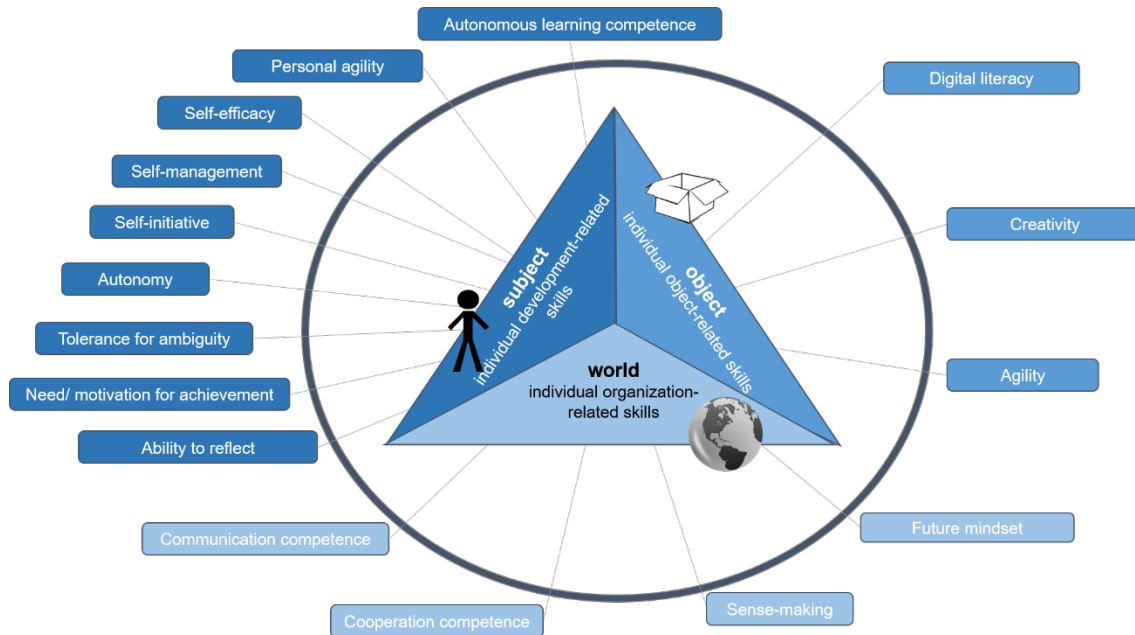


Figure 10. Typology of Future Skills (Ehlers, forthcoming)

Delphi participants were presented with a list of skills and descriptions and rated how important they found them to be for future higher education as well as how well they believe today's higher education institutions are equipped to support students in their development. Both variables were assessed on a five-point Likert-scale, whereby importance ranged from 5 = "very important" to 1 = "not important" and support from 5 = "very good" to 1 = "very poor". To gain an overview on the discrepancy between one skill's importance and its respective level of support, we calculated the delta, subtracting the mean support from the mean importance.

### Future Skills Info box

The term “future skills” is defined as the ‘ability to act successful on a complex problem in a future unknown context of action’. It refers to an individuals’ *disposition* to act in a self-organized way. This disposition expresses in actions (performance) and relies on knowledge, on skills and on values, which are necessary to judge the direction and intensity of action. Skills can be learnt and learning needs to involve concrete experience, also addressing emotions and challenging values of the learner.

Future skills can principally refer to three different but interrelated dimensions of the ability to act:

- (1) The subject-related dimension: These are skills which are directed to the individual itself and enable individuals to deal with themselves and their own development.
- (2) The object-related dimension: These are skills which enable individuals to deal with a subject matter related object or task
- (3) The organization-related dimension: These are skills which enable individuals to deal with their social environment – in the case of future skill related research to the organization in which they act.

The 16 skill profiles below each contain a number of subskills which are summarized below in brief.<sup>9</sup>

#### A. Subject-development related skills

1. **Autonomy (self-determination)**: capacity to make an informed, uncoerced decision and act accordingly
2. **Self-initiative (initiative and performance competence)**: individual ability to take an active and self-starting approach to work goals and tasks
3. **Self-management (decision competence)**: ability to lead and regulate oneself to decide in a self-responsible way
4. **Need/ motivation for achievement (initiative and performance competence)**: individual's desire for significant accomplishment, mastering of skills, control, or high standards
5. **Personal agility (self-competence)**: positive attitude, resilience and openness to changes, being comfortable in ambiguous and changing situations
6. **Autonomous learning competence (learning literacy)**: ability to continuously adapt through learning, know learning methods, evaluate own progress, ability to learn motivated
7. **Self-efficacy** (one’s own conviction to be able to act successfully on a given task)
8. **Tolerance for ambiguity (ambiguity competence)**: ability to deal with uncertainty and in different roles
9. **Ability to reflect (reflective competence)**: ability to critically analyze made experiences and learn for future contexts

#### B. Object-related skills (Instrumental skills)

10. **Agility (systems competence)**: ability to orient oneself in fast changing contexts
11. **Creativity (innovation competence)**
12. **Digital literacy**

#### C. Organization-related skills

13. **Sense-making**: ability to identify with and make sense of given organizational rules and values for one’s own life and work
14. **Future mindset (future and design competence)**: ability to productively develop an organizations’ context, continuously learn and develop one’s skills and to be open for new and unknown challenges within a given organizational context
15. **Cooperation competence**: ability to cooperate in teams and have social and intercultural skills
16. **Communication competence**: ability to actively create dialogue, achieve consensus and criticize

<sup>9</sup> Due to translations, terminology has been slightly adapted.

# Info Graph: Are Higher Education Institutions Prepared for Future Skills?

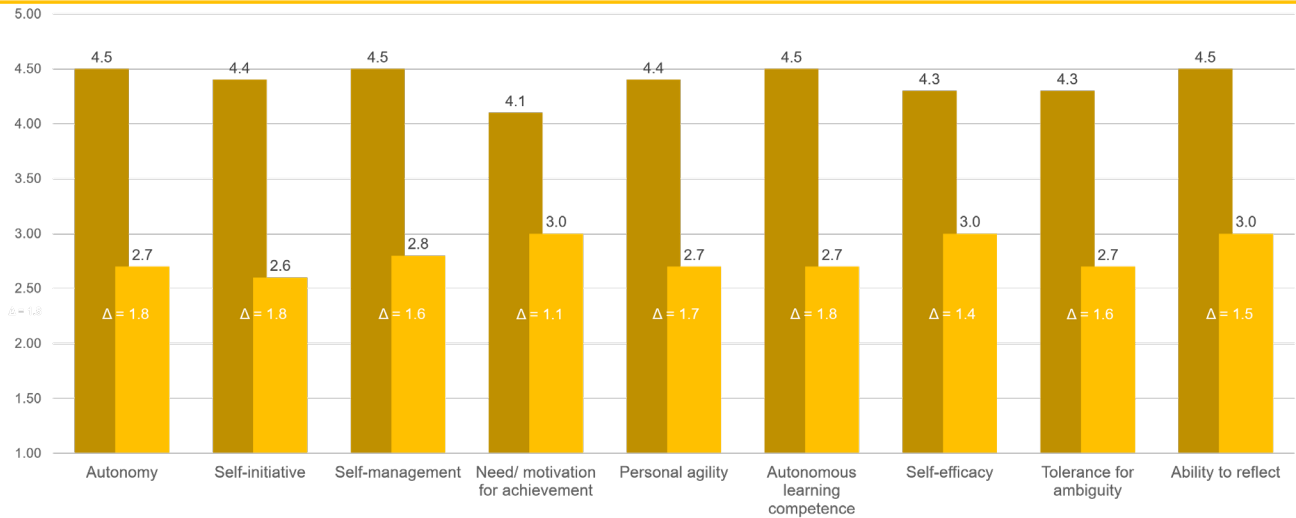


Figure 11. Importance versus current degree of higher education support of subject-development related skills

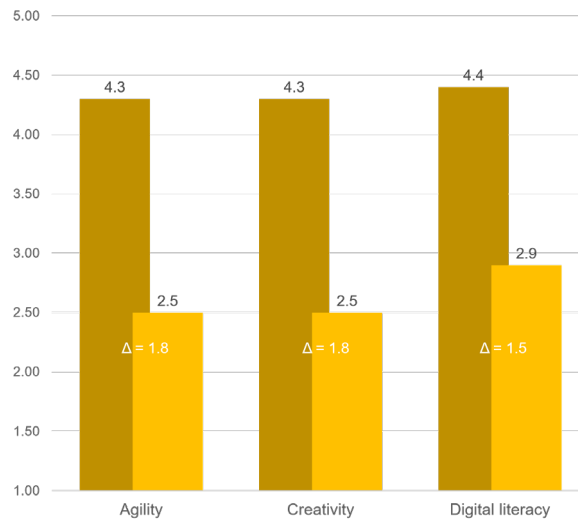


Figure 12. Importance versus current degree of higher education support of object-related skills

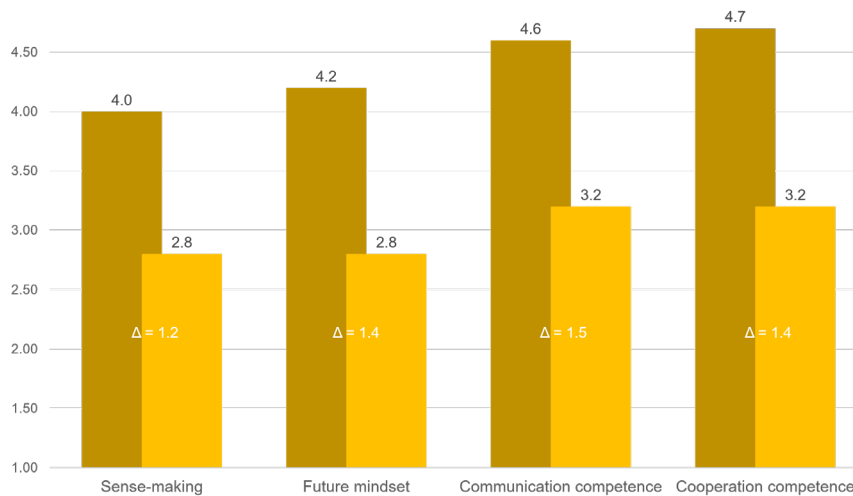


Figure 13. Importance versus current degree of higher education support of organization-related skills

### 3.3.1 Subject-development related skills

Subject-development related skills refer to skills which enable individual to act on issues in connection with themselves – like reflection, autonomy, self-efficacy, etc.

All individual development-related future skills are perceived as important, with autonomy (self-determination) and the ability to reflect (reflective competence) being rated as very important ( $M_{Autonomy} = 4.53$ ,  $SD_{Autonomy} = 0.62$ ;  $M_{Ability\ to\ reflect} = 4.50$ ,  $SD_{Ability\ to\ reflect} = 0.67$ ). Furthermore, the data reveals that the ability to reflect (reflective competence) is, together with self-efficacy, and need/ motivation for achievement (initiative and performance competence) one of the currently best-supported skills in HEIs compared to the other subject-development related skills. Autonomous learning competence (learning literacy) ( $M = 4.48$ ,  $SD = 0.69$ ) and self-management (decision competence) ( $M = 4.46$ ,  $SD = 0.72$ ) occupied the second and third most important positions. Contrary to that the degree of implementation in higher education, expressing the evaluation of exerts how well HEI are equipped to support the development of these skills is rated. The delta between both values has been calculated. It shows that the largest discrepancy is perceived for the autonomous learning competence (learning literacy) ( $\Delta = 1.83$ ) and autonomy (self-determination) ( $\Delta = 1.81$ ) – two of the skills that earlier had been rated among the most important.

On the contrary, need and motivation for achievement (initiative and performance competence) was assessed to be important ( $M = 4.13$ ,  $SD = 0.89$ ), and, according to the expert's sample's opinion currently acceptably supported within HEIs ( $M = 3.07$ ,  $SD = 0.93$ ).

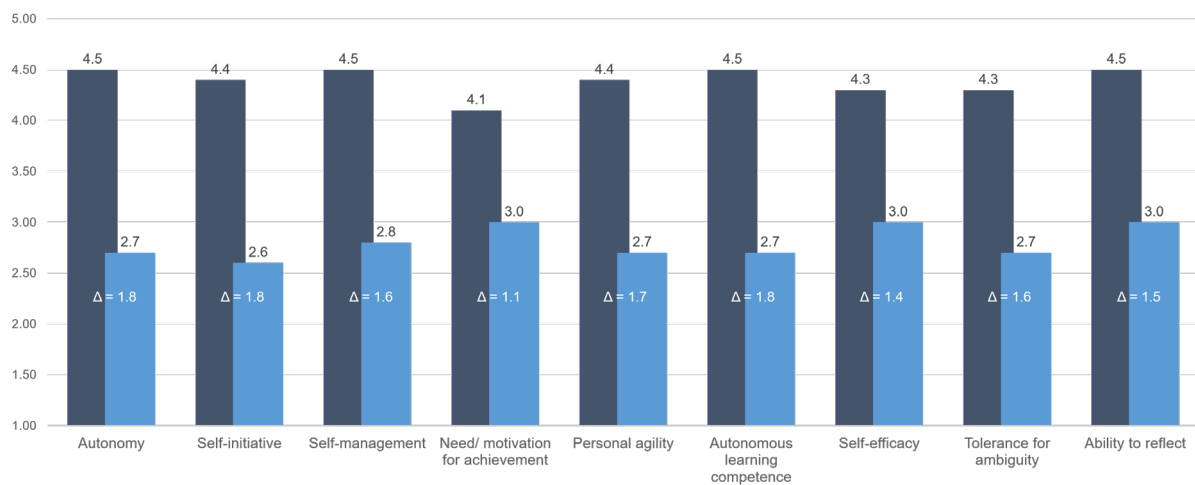


Figure 14. *Subject-development related skills: Importance (dark blue bars) versus current degree of higher education support (light blue bars) (N = 46)*

If having a look at the levels of discrepancy it is possible to assess the degree of urgency of developing concepts in order to support competence development. Where the delta is highest, urgency is greatest; where the delta is lower, also a lower urgency is perceived



Figure 15. Discrepancy values for Subject-development related skills between skill importance and current support through higher education (N = 46)

### 3.3.2 Object-related skills

Object related skills are skills, which are relying on individual dispositions to act in unknown future environments but where the object of action is not the individual itself but a certain object, which needs to be acted upon – e.g. a certain task.

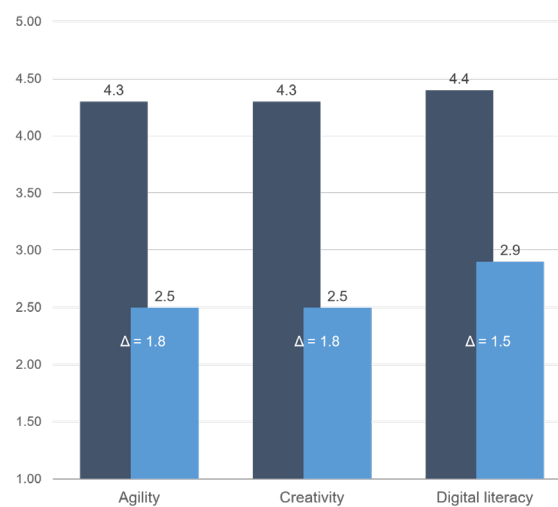


Figure 16. Object-related skills (Instrumental skills): Importance (dark blue bars) versus current degree of higher education support (light blue bars) ( $N_{Importance} = 44$ ,  $N_{Support} = 45$ )

The expert sample rated all skills to be important. Least support apparently exists for agility (systems competence) and creativity skills (innovation competence) ( $M = 2.53$ ,  $SD = 0.87$ ;  $M = 2.52$ ,  $SD = 0.85$ ), leading to the highest perceived discrepancy between agility skills' (systems competence) importance and their current support through HEIs.

Interestingly, although the debate continues that in many European countries students would not be well equipped through HEIs with digital skills, our expert sample perceived digital literacy skills to be acceptably supported ( $M = 2.93$ ,  $SD = 1.03$ ). Taking a closer look at frequency distributions, however, reveals that 40% of experts assessed current HEI's support as poor or even very poor as compared to 37,8% deeming HEI's support to be (very) good.

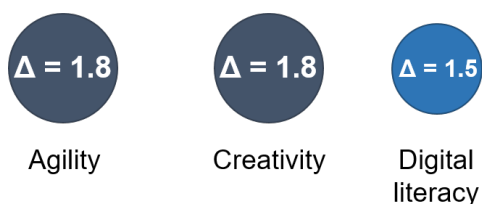


Figure 17. Discrepancy values for instrumental skills between skill importance and current support through higher education ( $N_{Importance} = 44, N_{Support} = 45$ )

### 3.3.3 Organization-related skills

Individual organization related skills are those skills, which are needed to act in organizational and social environments. Action is self-organized and understood as disposition.

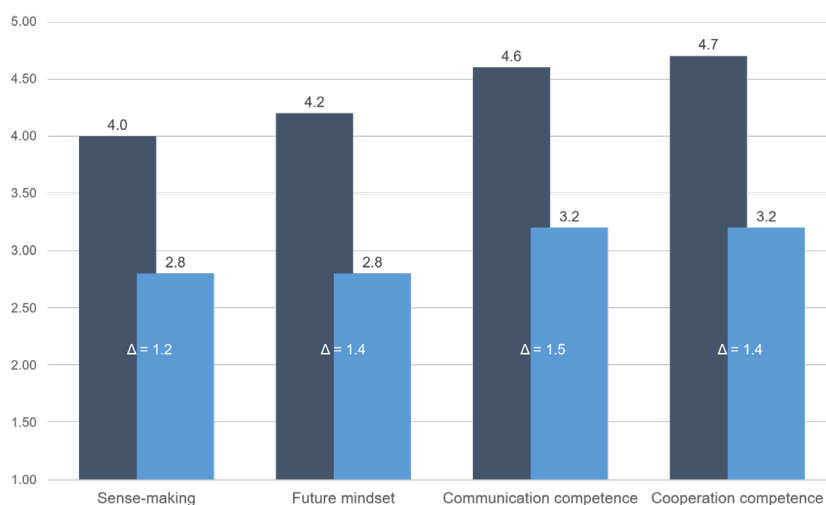


Figure 128. **Organization-related skills:** Importance (dark blue bars) versus current degree of higher education support (light blue bars) ( $N = 45$ )

In this section, all skills are perceived of as important, whereby cooperation and communication competences are even rated to be very important ( $M = 4.59, SD = 0.67$ ;  $M = 4.67, SD = 0.67$ ). Moreover, all skills were rated to be acceptably support within HEIs, whereby the two most important skills (cooperation and communication competences) were deemed to be the best supported across all future skills ( $M = 4.59, SD = 0.67$ ;  $M = 4.67, SD = 0.67$ )



Figure 19. Discrepancy values for personal skills between skill importance and current support through higher education ( $N = 45$ )

As regards participants’ qualitative comments on these skills, the most common was that between HEIs there would be high variance in support levels; one respondent saw variance not only between different types of HEIs, but also between programs and individual teachers. Another expert broadened this picture, pointing towards differences not only in HEI and teaching styles, but also in the receptionists – the students – who vary in terms of their personalities, age, and attitudes, leading to highly heterogeneous needs. One expert underlined



that content knowledge would be most important and should appear in the list as well, as the above in his opinion would be supplemental skills that accompanied content knowledge and skills but would not be of special importance without generally knowledgeable, skilled individuals. Moreover, some respondents argued that the identified skills would rather be personality traits, which therefore would be beyond HEI's responsibility.

## 4. Future Learning

The dimensions of future learning in higher education will comprise structural aspects and aspects of pedagogical design of academic learning. In terms of **structural aspects**, the following criteria will play an important role: academic learning as episodic process between biographical phases, professional and private episodes throughout life, learning as institutional patchwork instead of the one-institution-model of today, supported through more elaborated credit transfer structures, micro-qualifications and microcredentials. As regards the aspects of **pedagogical design of academic learning**, criteria such as changing practices of assessment, peer-validation, learning communities, a focus on future skills with knowledge playing an enabling role in interactive socio-constructive learning environments will play a key role.

In general, experts estimate structural changes to become relevant much later than changes related to academic learning design.

### 4.1 Structural Aspects of Future Learning

I - “Certification of small, modularized study experiences in form of micro-credentials is equally important as certification of entire degree programs.”

$M = 3.50$ ,  $SD = 1.10$ ,  $A = 56.8\%$ ,  $N = 44$

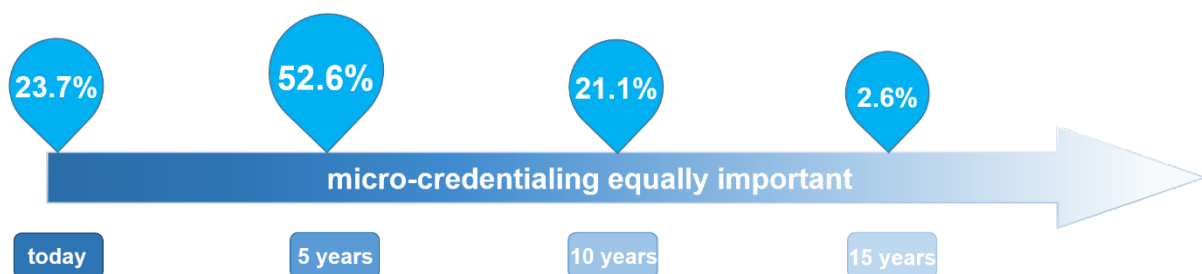


Figure 20. Estimated timeframe for the increasing importance of micro-credentialing ( $N = 38$ )

II - “Students study in several higher education institutions sequentially or in parallel, making their academic studies an “institutional patchwork” study experience.”

$M = 3.60$ ,  $SD = 0.84$ ,  $A = 60.0\%$ ,  $N = 45$



Figure 21. Estimated timeframe for the increasing importance of the institutional patchwork study experience ( $N = 38$ )

III - “The standard form of higher education is an episodic patchwork of study experiences through recognizing prior learning and existing competences.”

$M = 3.59$ ,  $SD = 0.96$ ,  $A = 59.1\%$ ,  $N = 44$

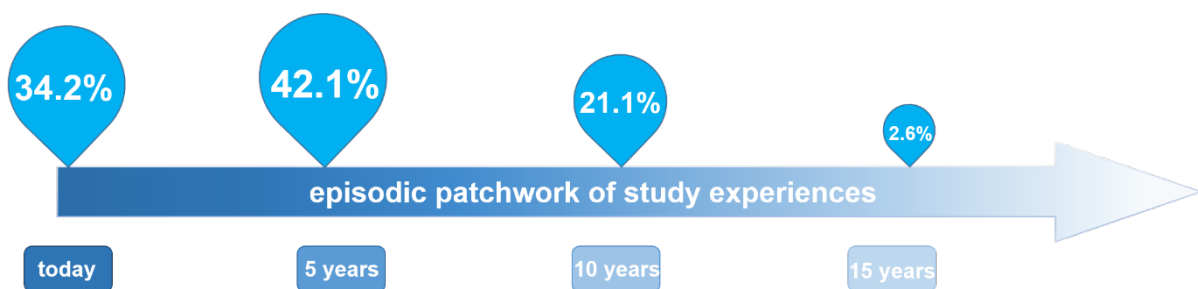


Figure 22. Estimated timeframe for the increasing importance of students' episodic patchwork of study experiences ( $N = 38$ )

IV - “Higher education systems are open to alternative study pathways and permeable.”

$M = 3.95$ ,  $SD = 0.82$ ,  $A = 81.8\%$ ,  $N = 44$



Figure 23. Estimated timeframe for the increasing importance of alternative study pathways ( $N = 38$ )

## 4.2 Pedagogy of Future Learning

Learning design will change for learning in higher education in the future. The models in question are already available and are tested, piloted and sometimes strategically pushed in institutions already. However, there is still a gap in diffusion and uptake throughout higher education institutions.

I - “The ability to act in unknown and complex future contexts as leading orientation in higher education over knowledge transfer.”

$$M = 3.64, SD = 0.99, A = 62.2\%, N = 45$$



Figure 24. Estimated timeframe for the increasing importance of students' ability to act in unknown and complex future contexts ( $N = 38$ )

II - “Assessment for learning (formative and peer assessment) as opposed to assessment of learning (summative assessment).”

$$M = 3.80, SD = 0.86, A = 66.7\%, N = 45$$

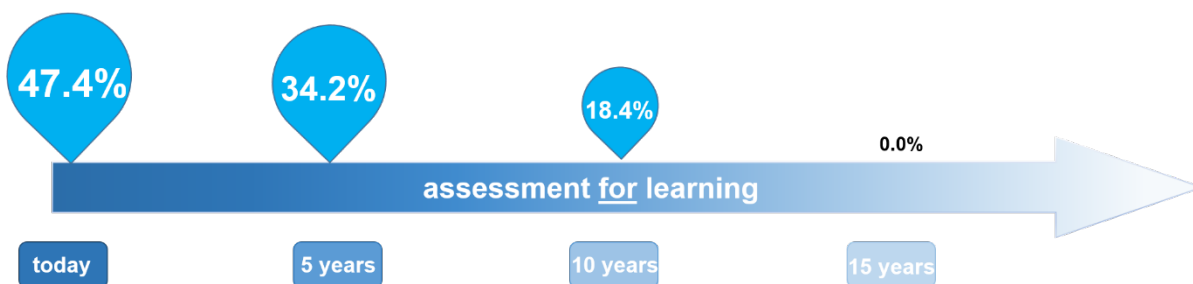


Figure 25. Estimated timeframe for the increasing importance of assessment for learning ( $N = 38$ )

III - “Key competences/ future skills do not replace knowledge transfer but are more important.”

$$M = 4.16, SD = 0.70, A = 91.1\%, N = 45$$



Figure 26. Estimated timeframe for the increasing importance of future skills ( $N = 38$ )

IV - “Future higher education models are structured in form of learning communities (learning with each other) than knowledge transfer-oriented (e.g. teachers lecture).”

$$M = 3.71, SD = 0.91, A = 60.0\%, N = 45$$



Figure 27 Estimated timeframe for the increasing importance of learning communities ( $N = 38$ )

V - “Learning design turns away from presentation and knowledge transfer methods and focusses on interactive socio-constructive designs instead.”

$$M = 3.76, SD = 0.76, A = 64.5\%, N = 45$$



Figure 2138. Estimated timeframe for the increasing importance of interactive socio-constructive learning designs ( $N = 37$ )

VI - “Higher education will involve more learning through peer-validation.”

$$M = 3.73, SD = 0.90, A = 62.2\%, N = 45$$



Figure 29. Estimated timeframe for the increasing importance of learning through peer-validation ( $N = 37$ )

Overall, the international expert sample expressed their agreement with the statements (all mean values ranging from 3.54 to 4.19). The least agreement was recorded for microcredentials that

would replace the traditional forms of gaining a certificate for having mastered an entire program ( $M = 3.54$ ,  $SD = 1.10$ ). The three most probable elements of future HE were rated to be future skills' increasing importance ( $M = 4.19$ ,  $SD = 0.71$ ), along with the notion that new quality standards would need to be developed to ensure graduates' work-readiness ( $M = 4.15$ ,  $SD = 0.82$ ), and that HEIs would become more diverse and permeable, allowing for alternative study pathways and non-traditional study groups ( $M = 4.00$ ,  $SD = 0.84$ ). In order for future skills to be trained within HEIs, respondents pointed towards teaching the teacher. Only if the HE personnel is capable of using the right training methods, there will be a chance for students to develop these skills according to the expert's opinion. Although the experts mentioned some criticism about quality standards' role as change drivers, they generally agreed that it would be necessary to adapt them in accordance to the new demands students will be confronted with. The increasing openness of HEIs, was said to be valuable for the whole society, but experts expressed some concern as to how ready HEIs would really be to engage in such a change process and whether these changes would really have the potential to level out or at least decrease social differences.

The experts identified five factors that they claimed to be already highly relevant for the current organization of HE (measured in terms of "already relevant" gaining most of the votes). These are the assessment for learning in terms of formative assessment, a stronger emphasis on future skills, an institutional patchwork of HEIs, peer evaluation and validation, as well as alternative study pathways. However, note that for all the five statements, the lion's share of respondents feels that these factors are not yet playing a major role within HEIs, but will only gain relevancy within the upcoming mainly five to ten years (as indicated by adding up the percentages for relevance indication in the next five to ten years).

According to the international expert board, short-term developments that will change the functioning of HEIs will probably be a shift from perceiving HEIs as knowledge transfer-oriented places towards learning communities and microcredentialing becoming relevant within the next five years, too. For graduates' ability to act in unknown and complex future contexts as main leading orientation in HE, more than half of the sample showed agreement that this trend would become relevant within the next five years.

Developments that will play a major role mid-term, are a shift towards interactive socio-constructive designs within HE learning and a more fluid path for students in terms of moving between institutions thanks to the recognition of prior learning and existing competences. However, note that for these two trends, the respondents indicating that they would already be relevant or would become so short-term, form a majority.



## 5. Future Higher Education: Key Drivers of Change

Resulting from the global and technological changes, societies at large (macrosystem), the organizations we are working in (mesosystem), as well as our immediate social environment and lives (microsystem) are mutually affected, and as a result, develop further in order to mitigate risks and explore further routes of expansion (Bronfenbrenner, 1977; Drakenberg, 2004).

### 5.1 What Shapes the Future for Higher Education?

It is quite likely that within higher education institutions as well as academic education and learning, a number of changes will result. In thorough analysis and through in-depth interviews with human resource responsible actors we have questioned the extent and direction of these changes. Our findings point to four different factors. We call them the “pillars of change for higher education” and refer through pillars to an architectural metaphor expressing that they span the room in which higher education will most probably develop within the next ten to fifteen years (see figure 30). It is impossible to delimit exactly the scope and shape of change, but our Delphi survey resulted in high agreement rates from experts into the four determining pillars of change, which are:

1. An emerging focus on future skills radically changes the current definition of graduate attributes in higher education.<sup>10</sup>

*Description:* The focus on a “next mode” of studying (focus on future skills: autonomous learning, self-organization, applying & reflecting knowledge, creativity and innovation, etc.) gradually replaces a reduced/ narrow focus on academic and valid knowledge acquisition as a means to provide correct answers for known questions based on a curriculum which is focused on defined skills for fixed professions.

2. Higher education increasingly becomes a multi-institutional study experience.

*Description:* The provision of higher education increasingly moves from a ‘one-institution’ model to a ‘multi-institution’ model in which higher education is provided through alliances of several institutions.

3. Students build their own personalized curriculum.

*Description:* The elements of choice in academic programs enlarge. The curriculum of academic programs moves from a fully predefined and ‘up-front’ given structure to a more flexible, personalized and participatory model in which students actively cooperate with professors/ teachers/ advisors in curriculum-building of higher education programs.

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<sup>10</sup> The statement is taken from the second iteration of the Delphi Survey, after it had been already validated and reformulated from the first round.

4. Higher education institutions turn towards providing offerings for lifelong higher learning services.

*Description:* The current model of higher education to prepare students (up front) for a future profession is equally complimented with higher lifelong learning offerings.

It is important to note that we explicitly argue with the metaphor of a development room in which profiles of higher education institutions most likely will develop in diverse configuration of the factors amongst each other.

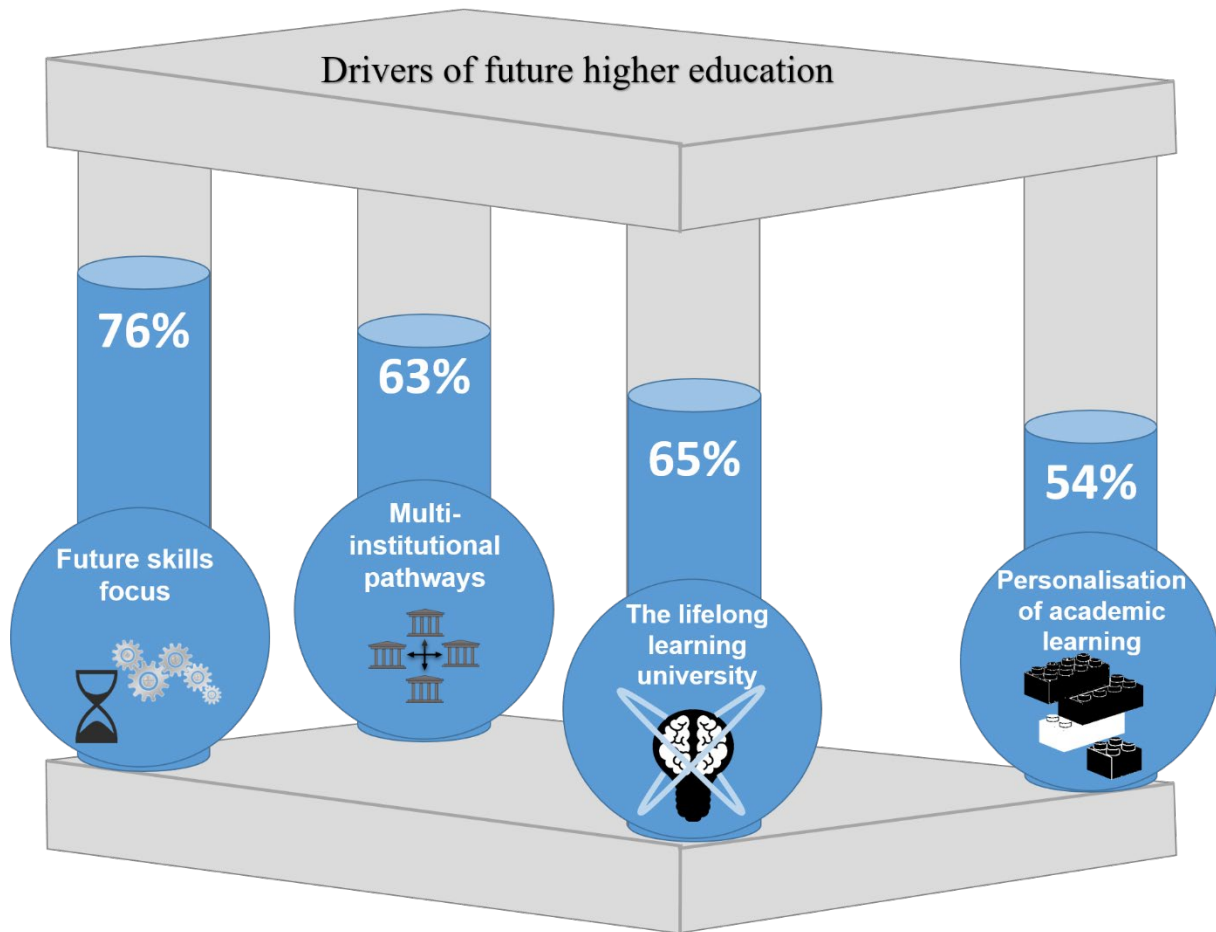


Figure 30. The Delphi's four-pillar room for future development and sample agreement ratio<sup>11</sup> (N = 46)

Participants of the Delphi study were asked to rate their level of agreement with the respective factor on a five-point Likert scale ranging from “strongly disagree” (=1) to “strongly agree” (=5). In case respondents wished to comment on the factor – for example for item reformulation

<sup>11</sup> Agreement indexes ( $A_{Factor1} - A_{Factor4}$ ) were calculated as the percentage of respondents that (strongly) agreed with the described factor. Following,  $A$  will be used to denote agreement levels.

purposes or specification/ justification of their answer – a commentary box was provided below each factor formulation.

## 5.2 Four Pillars of Change



### Pillar 1: Future Skills Focus

Factor 1 stated that there would be a new focus on future skills that would radically change the current higher education definition of graduate attributes. This entails that the current focus in higher education on academic and valid knowledge (learning as a means to correct answers for known questions, curriculum focused on defined skills for fixed professions) would be replaced by a “next mode” of studying. This “next mode” understands learning as application of and reflection about knowledge, as creatively developing new knowledge instead of learning course

material by heart. To support this, new learning and teaching methods would be applied that focus on the development of future skills. Figure 7 shows that our Delphi participants generally agreed with this factor ( $M = 3.81$ ,  $SD = 1.22$ ,  $A_{Factor1} = 76.1\%$ ). Analyzing their qualitative comments helped to refine the statement into a clearer and stronger vision on future skills and learning. It made clear that future skills and knowledge are not two opposing ingredients of higher education but are building on each other. Knowledge providing the basis for future skills but being not sufficient for higher education any more. Experts used terms like “specialized knowledge” or “knowledge mode 2” as semantic markers to indicate that a concept for ‘next knowledge’ is needed. These concepts relate to works of Gibbons et al. (1994), who talks about new and socially distributed production of knowledge. In addition, experts felt that the turn towards future skills would not represent a futuristic vision, but instead would already be underway in current HEI efforts. Experts’ opinions show a focus shift towards supporting the development not only of expert knowledge in a certain domain, but also on the set of skills that we refer to as future skills.

While the direction and concept of this development is clear from the experts’ opinion, it is clear that the future skill focus cannot be generalized across all higher education institutions, faculties and subjects, and study cycles (Bachelor and Master) equally.

### **Future Skills: Adoption time**

Interestingly, for the growing focus on future skills (factor 1) the majority of respondents (35%) indicated that HEIs would already be shifting their attention towards promoting such skills as autonomous learning, self-organization, applying and reflecting knowledge, creativity or innovation. This “next mode” of studying was assumed to gradually replace a reduced/ narrow focus on academic and valid knowledge acquisition as a means to provide correct answers for known questions based on a curriculum, which is focused on defined skills for fixed

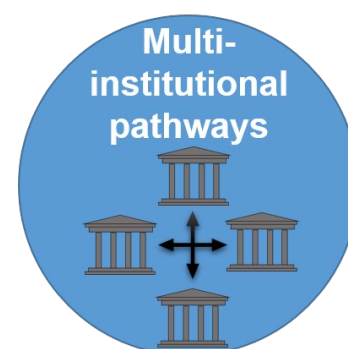
professions. Still, the remaining 65% estimated importance to an increase for these skills in the years to come.



Figure 31. Estimated timeframe for the increasing importance of a future skills focus within higher education ( $N = 40$ )

## Pillar 2: Studying through multi-institutional pathways

The second factor stated that HE would become a multi-institutional study experience, meaning that HE would in tendency abandon the current “one-institution” model, opening itself towards becoming one partner in an alliance network of several institutions. As indicated by the sample’s mean of 3.72 ( $SD = 1.12$ ,  $A_{Factor2} = 63.0\%$ ), experts generally support this concept. Multiple study pathways across institutional boundaries would need a much more developed practice of recognition of prior and/ or academic learning within the institutions. Students would then move from one institution to the other based on their preferences of choice, depending on the institutions’ offer, quality and reputation. Smaller or larger parts of curricula would be assembled across different institutions, resulting into a patchwork-like, multi-institutional organization of studies. While in Bologna signatory countries this aspect of credit transfer is already conceptually reality, on an institutional level it still lacks practicability. It can be seen that distance education institutions are already more advanced in this respect than traditional institutions. One Delphi participant reported that in Canada, students would already make use of transferring credits from one institution to another, specifically highlighting the role of the Canadian Virtual University. Two other respondents stated that they would see such a tendency in student university choice behavior: Students usually enroll in a Bachelor’s program at one university, and then switch to another for their Master’s. *Erasmus mundus* offering a Joint Master Degree is an integrated, international study program that is delivered by an international consortium of different HEIs (Smith, 2018). This program was also named as one already existing example of the increasing multi-institution approach. One participant even speculated that instead of multiple institutions, the internet might take over as one additional source for knowledge creation/ provision. Whereas these examples demonstrate that there is already some evidence for potential multi-institutional approaches, three participants, generally agreed that there will be a shift, but estimated that it would take five to ten years until this would become reality.



Furthermore, respondents tried to identify reasons for why universities would engage in such networking-efforts. One respondent stated for instance that he would see a major need for multi-institutional arrangements especially for smaller, specialized universities. In a similar vein, another respondent raised concerns about larger universities (e.g. the Ivy League Colleges) adopting multi-institutional approaches, as it would blur their strong branding. Apart from the

respective university's character, it was also mentioned that regulatory and economic frameworks would potentially act as enabling or restraining conditions under which such multi-institutional arrangements could be created. Moreover, two other respondents identified students as one of the key influencers for whether this factor would turn real.

### Multi-Institutional study pathways: Adoption time

The second factor “multi-institutional study pathways” is estimated to be adopted by HEI between five and ten years from today. The majority of respondents saw this gaining importance within the upcoming five (30.8%) to ten years (30.8%). Multiple study pathways across institutional boundaries would need a much more developed practice of recognition of prior and/ or academic learning within the institutions. Students would then move from one to the other institution based on their preferences of choice, depending on the institutions' offer, quality and reputation. Small or larger parts of curricula would be assembled across different institutions, resulting into a patchwork-like, multi-institutional organization of studies. While the Bologna process and European qualification frameworks are laying the groundwork, reality of mutual recognition of credits is still far from reality – which is reflected in the experts' opinion. Given the systemic nature of this factor and the need for HE to develop overarching transfer-systems, portable credentials and mutually trusted and understandable formats for academic achievements and learning, this seems a rather fast-paced development.



Figure 32. Estimated timeframe for the increasing importance of multi-institutional study pathways ( $N = 39$ )\*<sup>12</sup>



### Pillar 3: Personalization of academic learning

The role of students was further investigated as the third factor. It was proposed that students would build their own personalized curriculum in collaboration with educational professionals. This would then result in a significant enlargement of study possibilities that – in addition – would move from a pre-defined ‘up-front’ given structure to a personalized and participatory model in which students actively participate and collaborate with educational professionals in curriculum building of their program.

Agreement of the Delphi participants to this factor was similarly high ( $M = 3.68$ ,  $SD = 0.98$ ;  $A_{Factor3} = 54.4\%$ ). Most of the constructive reasoning regarding the above factor concerned institutional resistance along with an emphasis on students' capabilities

\* Note: In this figure and the following ones, percentages may add up to more than 100% due to rounding errors.

needed to build their own curriculum and make meaningful use of the larger degree of freedom of choice. These comments were coming along with questions on academic concepts of quality for such personalized future study modes.

With regards to the HEIs, respondents said that a culture shift would be necessary that would adopt a more educational view. Although the experts mostly agreed that it would be desirable for students to design their own curricula and have more freedom of choice, they also advocated for institutions to become active here and serve as a safety net. In this regard, the degree of personalization goes along with more coaching and support of students building their own academic structures gradually becoming more autonomous learners. This function was considered necessary as an instance of reflection of progress and position within a highly personalized curriculum is considered necessary. It is obvious that this factor would call for a radical paradigm shift, which institutions and higher education stakeholders at large do not have experience with. However, diversifying target group and intake of more and more non-traditional students seems to be calling for a higher degree of personalization, which reflects in high levels of agreement while at the same time raising concern about how to implement it.

### Personalization of Academic Learning: Adoption Time

Factor 3 is a very pressing development given the OECDs estimation of increasing student numbers in industrialized countries (Baethge et al., 2007; Teichler, 2009; OECD, 2016). Through this development, more diverse target groups will come into HEI and will need to be catered for within their differences. Personalization, studying at different paces, and a great variety of choices for different contexts by students from different walks of life in different biographical phases will demand a more personalized approach of academic education through HEI. It is likely that a growing number of students with a growing diversity can only be managed through improved target group-oriented study, approached in the structure of academic programs that take into account the factors of diversity of learning and the orientation of future student populations. The curriculum of academic programs would thus have to move from a fully predefined and ‘up-front’ given structure to a more flexible, personalized and participatory model in which students would actively cooperate with professors/ teachers/ advisors in curriculum building of higher education programs. The range of personalization is starting from bridging programs supporting students in their first steps of academic life and is stretching via greater freedom of choice in contents and modules, and not ending at “build your own curriculum approaches”. The majority of Delphi participants indicated that this would probably only become true within the next five (36%) to ten (39%) years.

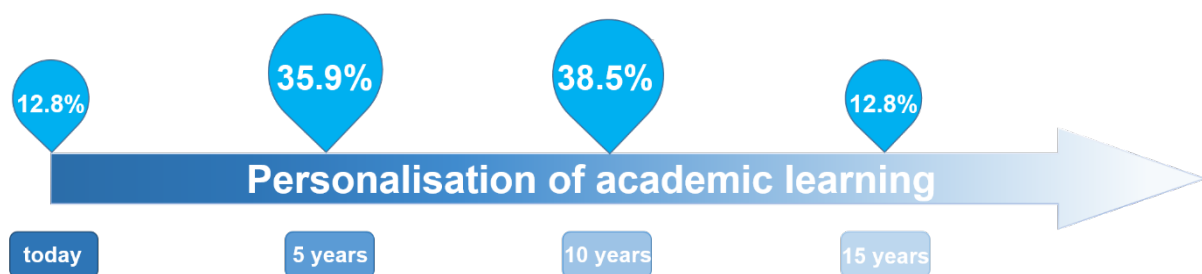


Figure 33. Estimated timeframe for the increasing importance of personalized academic learning (N = 39)



#### Pillar 4: Lifelong higher learning

The fourth pillar of change stated that lifelong higher learning would become as important as the (current) ‘up front’ or ‘preparatory mode’ of HE, being of equal or greater importance. By the currently followed ‘preparatory mode’ in HEIs, the current HE model is addressed. This model builds on the assumption that academic study is following the paradigm of transferring certain knowledge, which later-on in a professional context will be useful for coping with tasks and being a professional. Through fast changing knowledge, technology adoption rates, as well as changing professional contexts, this preparation up-front is coming under increasing pressure and is increasingly questioned. A rising gap between knowledge and skill preparation capacity and demand for new knowledge and skills through innovation in professional contexts can be observed.



One way to mitigate the risk caused through the gap is a stronger focus on future skills rather than knowledge, which is addressed in factor 1. Lifelong learning, or if adapted to the field of higher education, lifelong higher learning or lifelong academic learning is allowing students and/ or professionals to constantly learn and adapt to new professional or personal challenges. It is not only a concept, which can and should be thought from the perspective of an individual. Moreover, this points towards a paradigm shift within HEIs: To view academic education no longer as a phase in the beginning of one’s professional life but to understand it as a continuum of constant biographical learning episodes. In order to accompany individuals on this path, a major shift in concepts and provision would need to take place. What today is the professional master and bachelor section would need to become mainstream with bachelor’s and master’s phase qualifications as foundational episodes in the beginning. Credit transfer, recognition of prior academic and professional learning, compatibility of different competences, and flexible pathways would allow construction and reconstruction of individuals’ own lifelong higher learning journeys. Delphi participants were in high agreement with this factor ( $M = 3.72$ ,  $SD = 1.33$ ;  $A_{Factor4} = 65.2\%$ ).

Although most of the respondents said that they would consider a shift towards life-long higher learning (LLHL) as desirable, on a practical level experts expressed their doubts about HEI’s willingness and capabilities to perform such changes. Two respondents pointed to huge country differences caused through national policymaking. Some experts suggested that LLHL would not necessarily need to be situated within HE, but rather be each individual’s own responsibility. Lastly, it was mentioned that providers outside of HE would play a more important role in the future.

“Learning itself will extend through life but not necessarily as a customer of HE.”

The answers made it clear that while LLHL is currently seen as important, future development for HE, HEIs, as well as national policymaking need to turn towards supporting the necessary change to make it a reality.

#### **Lifelong higher learning: Adoption time**

LLHL is on the rise in view of the expert’s opinion. Roughly, one third (28%) suggest that HEIs are today already starting to treat LLHL as equally important as standard academic programs;

four out of ten believed this would gain relevance within the next five-year period (38%), and roughly one fourth suggests that this will become reality within the next ten years. Given the systemic nature of shift, which is addressed here for HEIs and policymaking, the time of adoption within the next five-year period seems very fast. However, on national as well as on European level, programs have been launched to develop policies, which in the pace of five to ten years can well turn education systems into this direction. Especially under conditions of faster changes in knowledge, technology adoption rates as well as changing professional contexts, this time to adoption can be accelerated even more.



Figure 34. Estimated timeframe for the increasing importance of lifelong higher learning (N = 39)

# Info Graph: Four Scenarios for Future Higher Education: Likelihood and Time of Adoption

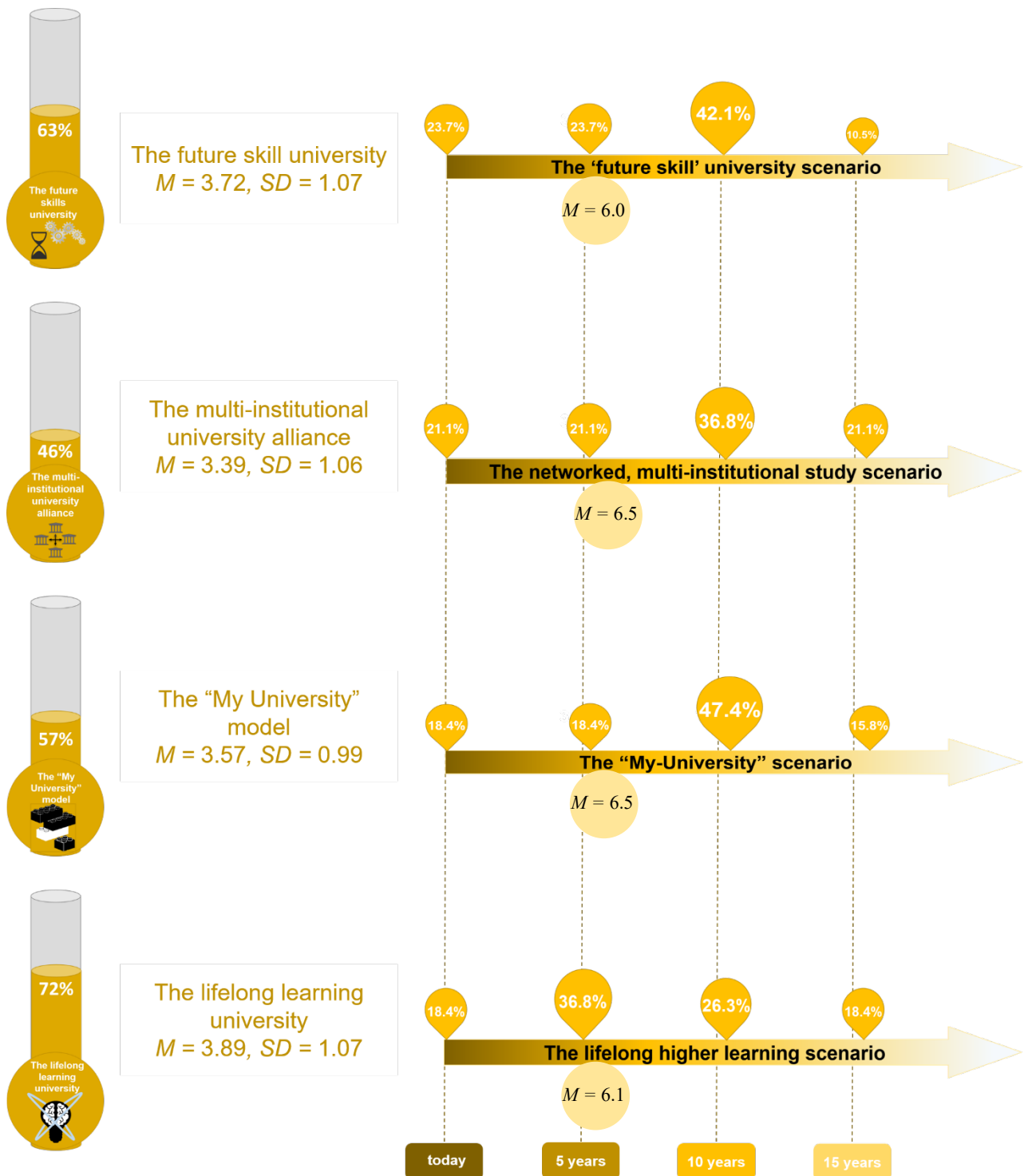


Figure 35. Overview on agreement levels and adoption times of potential scenarios for future higher education from a student's perspective ( $N_{Round1} = 46$ ,  $N_{Round2} = 38$ )

## 6. Future Higher Education: Four Scenarios

The four pillars of change in higher education open the room for development of higher education for the future. Depending on their configuration and intensity of development, study experiences will change. We therefore have presented Delphi experts with several scenarios, which are based on the assumption that the four factors would take effect.

Table 3 is outlining the conditions for the different scenarios. They build on the baseline scenario that all four pillars of change are existing in a low-intensity. This resulted into the following scenario of today's higher education experience:

### Baseline Scenario Today: Business as usual

Higher education is generally institutionally bound – students enroll in the institution in which they later also graduate from, usually directly after leaving high school. They study with given pre-defined curricula and content in order to achieve pre-described learning outcomes, which are related to/ derived from a system of fixed professions. Study programs are rooted in academic disciplines and schools of the current academic system.

The baseline scenario assumes low intensity of all four factors. Building on that four (mutual) potential future scenarios were created, with factor configuration as shown in table 1, thereby adopting a student's perspective. As can be seen from the table below, the scenarios build on each other. We asked respondents in the Delphi to rate their level of agreement with the described scenarios on a five-point Likert-scale ranging from strong agreement (=5) to strong disagreement (=1). Additionally, respondents were offered a chance for reformulation of the statements or justification for their rating in a free text field.

Table 3: *Method of scenario building for current and future higher education from a student's perspective*

Factors	Scenario: Today	Scenario: Future 1	Scenario: Future 2	Scenario: Future 3	Scenario: Future 4
Future Skills	Low intensity	High intensity	High intensity	High intensity	High intensity
Multi-institutional	Low intensity	Low intensity	High intensity	High intensity	High intensity
Personalization	Low intensity	Low intensity	Low intensity	High intensity	High intensity
Lifelong	Low intensity	Low intensity	Low intensity	Low intensity	High intensity

## Info Graph: Four Scenarios for Future Higher Education

### Scenario 1: The future skill university

“Future higher education is largely organized around the main objective to enable the development of graduates’ future skills: e.g. complex problem solving, dealing with uncertainty or developing a sense of responsibility. This goes beyond knowledge transfer and a focus on defined curricula for fixed professions. Students focus more on reflection, application and creative development of new knowledge and academic methods. The main point of orientation is to develop skills for acting successfully in unknown future contexts in their field of profession.

$$M = 3.72; SD = 1.07; A_{Scenario1} = 63.1\%$$

### Scenario 2: The multi-institutional university alliance

“In addition to scenario 1, the standard higher education experience is shifting from a one-institution model to a multi-institutional model. This involves a large part of academic programs provided by higher education alliances of several institutions, and study pathways, which become multi-institutional and patchwork-like. Cooperation and digital import and export of curricula play an important role. From the student’s perspective, the importance of institutional boundaries has diminished. A diversification of academic providers has taken place, with institutions specializing in certification while others are focusing on delivery and learning.

$$M = 3.39, SD = 1.06, A_{Scenario2} = 45.7\%$$

### Scenario 3: The “My University” model – personalized higher education

“In addition to scenario 2, the degree of autonomy of students has enlarged greatly. Students are guided by professors/ teachers/ advisers to become autonomous learners and engage in building their own curriculum by choosing and assembling their academic study portfolio from across several academic programs and academic institutions. Disciplinary boundaries for academic programs are more flexible and allow for students’ individual study pathways. The leading point for orientation will be students’ increasing degree of autonomy and their personal study needs as well as their future professional context.

$$M = 3.57, SD = 0.99, A_{Scenario3} = 56.5\%$$

### Scenario 4: The lifelong learning university

“In addition to scenario 3, seamless lifelong higher learning is as important as initial higher education. Learners in the workplace are the main type of student. Students choose their portfolio of modules according to their personal skill needs and competence demands with high autonomy throughout their lifetime. Institutions offer micro-credentials, which students assemble individually based on their own interests.

$$M = 3.89, SD = 1.07, A_{Scenario4} = 71.7\%$$

## 6.1 The ‘future skill’ university scenario

The ‘future skill’ scenario suggests that HEIs would leave the current model that focusses on knowledge acquisition. Instead, new profiles would be developed that emphasize graduates’ future skill development. In this scenario, HE would mainly be organized around one key objective: to enable the development of graduates’ future skills, i.e. complex problem solving, dealing with uncertainty or developing a sense of responsibility, etc. This would not replace but go beyond the current emphasis of knowledge acquisition and studying based on defined curricula for fixed professions. Instead, students’ focus on reflection of values and attitudes, application of existing and creative development of new knowledge and methods would move towards the center of attention. The main ambition within this scenario thus would be to enable students to act in unknown future contexts in their field of profession.

### Level of agreement

Delphi experts expressed high levels of agreement for the future skill university scenario, ( $M = 3.68$ ,  $SD = 1.07$ ,  $A_{Scenario1} = 63.1\%$ ).

Experts emphasized that future skills will not replace the concept of knowledge but will build on it on higher levels of learning, which will be a necessity for future academic education. Future skills will have to focus on helping students to deal with different degrees of uncertainty. Experts largely agreed that HEIs would need to provide learning opportunities that focused on future skill development. In addition, they elaborated that the definition of future skills and their scope would depend on disciplines and thus would be context-bound and not an overall approach serving to cover all.



Figure 36. Estimated timeframe for the increasing importance of the ‘future skill’ university scenario ( $N = 46$ )

The majority of respondents (45.7%) estimated that this scenario would become relevant within the next ten years only ( $M = 2.39$ ,  $SD = 0.97$ ).

### Conditions for adoption

Analyzing the qualitative comments yielded that the main reason for the experts mainly voting for the mid-term period option were HEIs inertia, a cultural resistance within HEIs, as well as the slow pace at which new laws can be passed, and financing rules can be changed. Moreover, it was stressed that apart from the macro- and meso-level changes (country-level policies, institutional policies), HEI staff as well as students also would need to change their mind-sets.



Moreover, heterogeneity of countries and types of HEIs were identified as key moderators of such processes. Whilst some experts reported that business schools would be actively working towards equipping their students with future skills, especially the “traditional universities” were often said to still focus mainly on knowledge transfer.

“It is already a reality that the knowledge needed for a certain profession is evolving constantly and needs a permanent update. So, having the skills for this adaptation and having skills more focused on developing capacities is much more important than just information and knowledge in a specific field.”

## 6.2 The Networked, Multi-Institutional Study Scenario

In the second scenario, we suggested that in addition to future skills playing an important role for HE, it would not be down to a single institution providing a student with a certain program, but that this role would be split among multiple institutions. This means that ‘digital import’ and ‘digital export’ of parts of the curriculum would play a significant role. The standard HE experience would shift from a “one-institution” model to a “multi-institutional” model. From a student’s perspective, the fact to be enrolled in HEI1 would not automatically mean to graduate also from HEI1, nor, to take all courses from HEI1. Rather, studying would be a networked experience, which depends more on interest, individual preferences for themes and profiles, desired access to specific facilities or course profiles. From an institutional perspective, it would entail to enter alliances and networks with other HEIs and HE-providers, develop cooperation interfaces and mutually recognize portable credits and certificates. Academic programs in this scenario would be provided through alliances of higher education institutions and enable students to choosing individual ‘patchwork-like’ study pathways, across institutional boundaries. This would become possible through cooperation as well as digital im- and export of curricula. From a student’s perspective, institutional boundaries would thus become less visible and a diversification of academic providers would take place, with some institutions specializing in certification while others would be focusing on delivery and learning. Academic programs would thus be provided by several institutions, and institutional boundaries would dissolve progressively. Consequently, a specialization of academic providers would take place with institutions specializing in certification while others would focus on delivery and learning.

### Level of agreement

The level of agreement for this scenario has been lowest from all in question. Still, Delphi participants expressed with a mean value of  $M = 3.43$  their agreement, meaning that the constructive majority leans towards a positive view of the scenario. ( $SD = 1.06$ ), which is reflected in an agreement index of 45.7%.

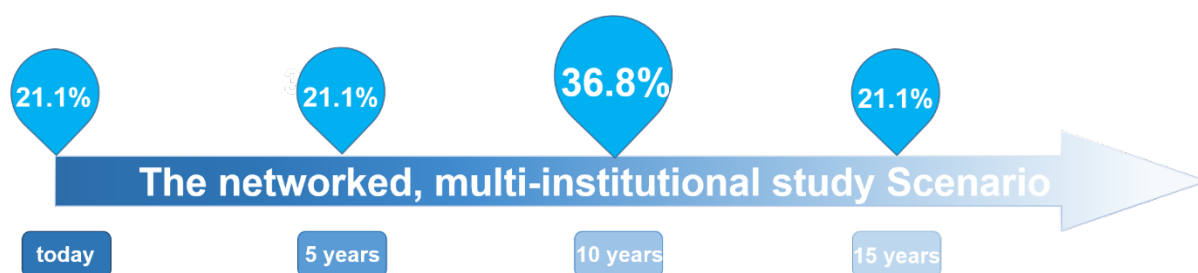


Figure 37. Estimated timeframe for the increasing importance of the networked, multi-institutional study scenario (N = 46)

Experts voiced that they doubted HEI's willingness to change as it could potentially weaken their position in a situation of competition. Constructive discussion is needed to specify the conditions under which HEIs can turn towards a consequent cooperation, respectively analyzing the conditions which lead to higher competition. This would also reveal country differences. Business models, including instruments for recognitions and credit transfer for such HE alliances would also have to be developed in order to provide motivators for such arrangements between HEIs. It was expressed that student demand will drive this scenario:

“A rather neo-liberal ideal of a market place with infinite choice and competition but at what cost? I'm not sure this is as liberating as it sounds.”

### Conditions for adoption

The second scenario was estimated to become reality within the next ten years. However, the experts name clear conditions, which will drive the realization of the networked multi-institutional scenario:

- HEI's will to preserve their own identities and status, while entering into an intensive cooperation and recognition process might be seen as risk of losing the ownership for programs.
- Moreover, although some respondents underlined the benefits of this scenario, some questioned whether it would be generally applicable and desirable across countries and types of HEIs.
- Credit portability needs to mature more in both ways, on the side of the receiving HEI as well as on the side of the issuing side of HEI.

### 6.3 The “My-University” Scenario

The “My University” model describes HEIs as spaces where the elements of choices enlarge and students can build their own curricula based on their personal interests. The curriculum of academic programs in this scenario would move from a fully predefined and ‘up-front’ given structure to a more flexible, personalized and participatory model in which students actively cooperate with professors/ teachers/ advisors in curriculum building of HE programs. As a result, disciplinary boundaries for academic programs would increasingly vanish, and together with educators / professors from across different academic disciplines, students would develop their study pathways and their own personalized curriculum.

The leading point of orientation would be students' personal study needs and their future professional context. Most of the sample experts argued that from their point of view, disciplinary boundaries would not dissolve completely, but rather loosen slightly as to allow for more flexible, personalized curricula.

One respondent, who went through a study program with high degrees of personalization, wrote:

“ The challenge was creating a balanced 'degree' (temptation to choose 'easy' or familiar subjects) so some criteria should be agreed on, such as a balance between practical/theoretical, subject-related/soft skills. Future professional contexts are uncertain, so this scenario needs to be associated with sound orientation approaches, both human and machine-based. ”

### Level of Agreement

The sample showed a slightly higher agreement-tendency for the third future scenario ( $M = 3.57$ ,  $SD = 0.99$ ) According to the respondents' perceptions, this scenario would become relevant within the next ten years. About 56.5% are in agreement or strong agreement with the scenario.

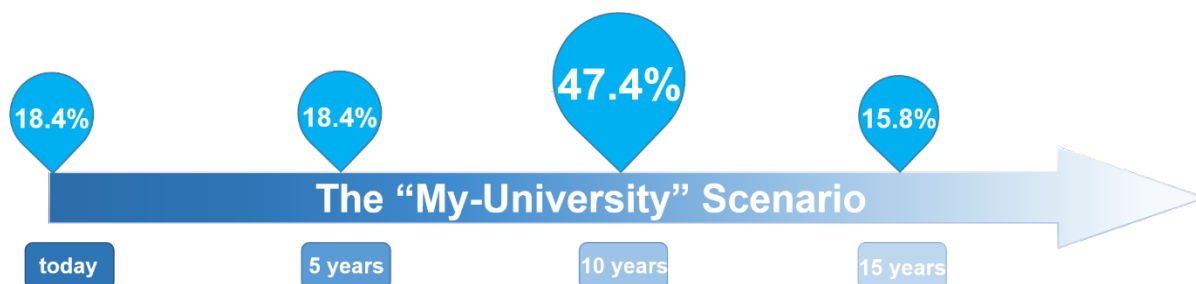


Figure 38. Estimated timeframe for the increasing importance of the “My University” scenario ( $N = 46$ )

Many respondents expressed their concerns as to how desirable from a student's perspective this personalization scenario would really be. On the one hand, it is clear that with flexibilization, students are able to focus on subjects that are interesting for them, on the other hand, it can be questioned, whether students are already able to decide what is not only interesting, but also important to know. Thus, the majority of commentators argued that in addition to personalization, institutions would need to offer guidance and support in order to assure that students possess the fundamental knowledge in a certain program. Further, it was suggested that the degree of personalization potential would also depend on the field, national approaches, as well as traditions, and the student her-/himself:

“ I believe that there is room for personal learning paths for professionals and skilled workers, who wish to upgrade or diversify their work. Younger students don't have much of an idea on their personal study needs, but professionals in the field can better makes these choices. ”

In a similar vein, one respondent added that personalization would make sense starting at the post-graduate level, as until this level students would then possess the necessary foundation already. Two respondents, who were generally evaluating personalization positively, raised concerns about how comparability of personalized degrees however. Currently, it is rather easy to assess which diploma is expressive of which skills and competencies; but as diversity increases due to personalization, this comparability may blur. Thus, further mechanisms would need to be introduced that would somehow be able to assure that quality standards are met.

### Conditions for adoption

According to the respondents' perceptions, this scenario would become relevant within the next ten years. This may be down to scarce resources, the complex nature of such a set-up, and the fact that a high degree of individualization would be necessary. This does not only require technological infrastructure, but also counseling skills of teaching staff (who need to become mentors and guides) and high degrees of autonomy and responsibility from students' side according to the experts. An increasing number of students and a parallel decrease of funding was mentioned as particularly challenging. Moreover, respondents stressed that such a model might not be equally well-suited for all students: For undergraduate students, the sample doubted that high degrees of freedom with regards to tailoring together a curriculum would be beneficial, e.g. because of low degrees of students' self-responsibility and familiarity with the HE context. In a master's program however, the respondents saw more room for such a flexibilization.

This also points to the importance of preserving sufficient degrees of employability. New quality assurance mechanisms will need to be developed here-fore, a factor, which also prolongs the process.

### 6.4 The Lifelong Higher Learning Scenario

In this scenario, seamless lifelong higher learning would be as important as initial higher education. Learners in the workplace would be the main type of student, choosing their portfolio of modules according to their personal skill needs and competence demands with high autonomy throughout their lifetime. Institutions thus would offer microcredentials, which students assemble individually based on their own interests. Recognition of prior study achievements and practical experiences would enable permeable shifting between different providers, which offer to bundle prior learning experience into larger certifications.

Higher education would progressively shift from an 'up-front mode' of higher education to a new form of seamless LLHL. Students would choose their portfolio of modules with high autonomy according to their personal/ professional skill needs and competence demands throughout their lifetime. Institutions in turn, would offer portable microcredentials, which could be assembled into larger compatible degrees depending on students' choices.

## Level of Agreement

This scenario gained the highest agreement indexes among experts: Compared to five respondents expressing their disagreement (indicated by values of 1 or 2), 71.7% of the sample expressed their (strong) agreement (as indicated by values of 4 and 5).



Figure 39. Estimated timeframe for the increasing importance of the lifelong higher learning scenario (N = 46)

In their qualitative comments, experts described this scenario as “desired”, referring to LLL as a “crucial element” or even as the “most important trend”. However, most of the respondents wished to slightly modify the scenario, doubting that HE’s ‘up-front mode’ could completely be replaced by student-tailored curricula. Instead, they imagined a scenario with HEIs still preparing their students the traditional way but opening up themselves for professionals, thus introducing a respective portfolio extension. Hence, it was suggested that in the future, HEIs would also focus more on retaining strong relationships with their alumni, who would refer to their *alma mater* during professional life whenever further education would be required. Further, respondents stated that in order for individuals to stay competitive in our “global village”, the need for LLL would be as high as never before.

Doubts about this scenario revolved mainly around two themes: First – and as mentioned for other scenarios, too – respondents suggested that there would be too much inertia and resistance within HEIs. This would hinder them to engage in efforts to perform the necessary changes that would allow them to shift their focus towards LLL. Second, respondents stated that the decision would not solely be in hands of HEIs, but also, and maybe even more importantly down to employers. They would also need to recognize the importance of LLL and grant their employees additional learning times.

## Conditions for adoption

This previous section yielded that the majority of experts sees LLL as the major trend within HE. Though respondents expressed their doubts about early shifts into this direction, the fourth scenario emphasizing LLL’s role for the future of HE gained strong support. Whereas the experts’ opinions were rather divided in terms of the multi-institutional scenario, respondents generally expressed agreement with the scenarios emphasizing personalization of curricula as well as HEI’s stronger focus on future skills.

Here, the majority of respondents assumed this scenario to become relevant within the next five years already. One reason for this can be seen in the fact that there are already some models that allow for dual or cooperative education. Thus, according to the experts, the remaining

challenge consists in establishing a system of microcredentialing. Moreover, one respondent wrote:

“After initial higher education, as a factor of the rapid technological changes and the changing professional profiles the lifelong higher education is a viable reality already in the short term.”

Hence, Industry 4.0 was identified as the “motor” behind this development. Still, the expert board argued that a change, not only within HE, but also and maybe even more importantly within organizations would be necessary, as employers would not often grant time for study as part of employee’s work time. Although it will take some time until this mode potentially becomes increasingly important, there is high potential in it for HEIs that can enlarge their portfolio and student base, as well as for society as a whole.

## Two Success Critical Concepts: Adaptation & Uncertainty

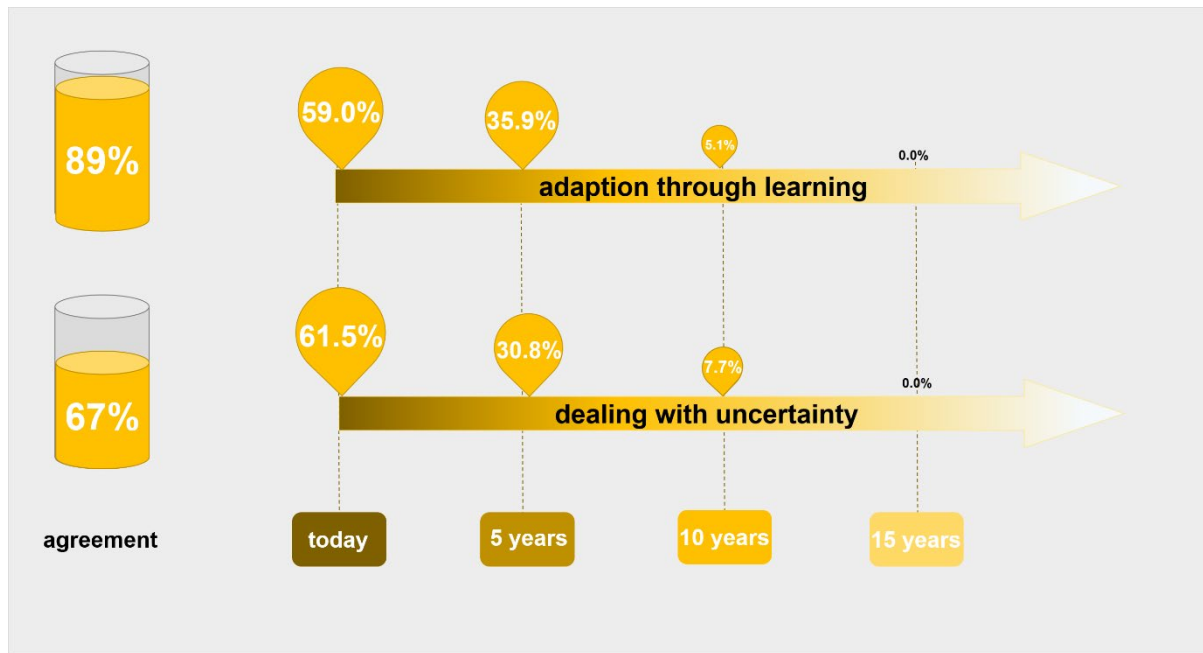


Figure 40. Agreement levels and adoption time estimates for the two main objectives for future higher education

## Info Graph: Future Skills

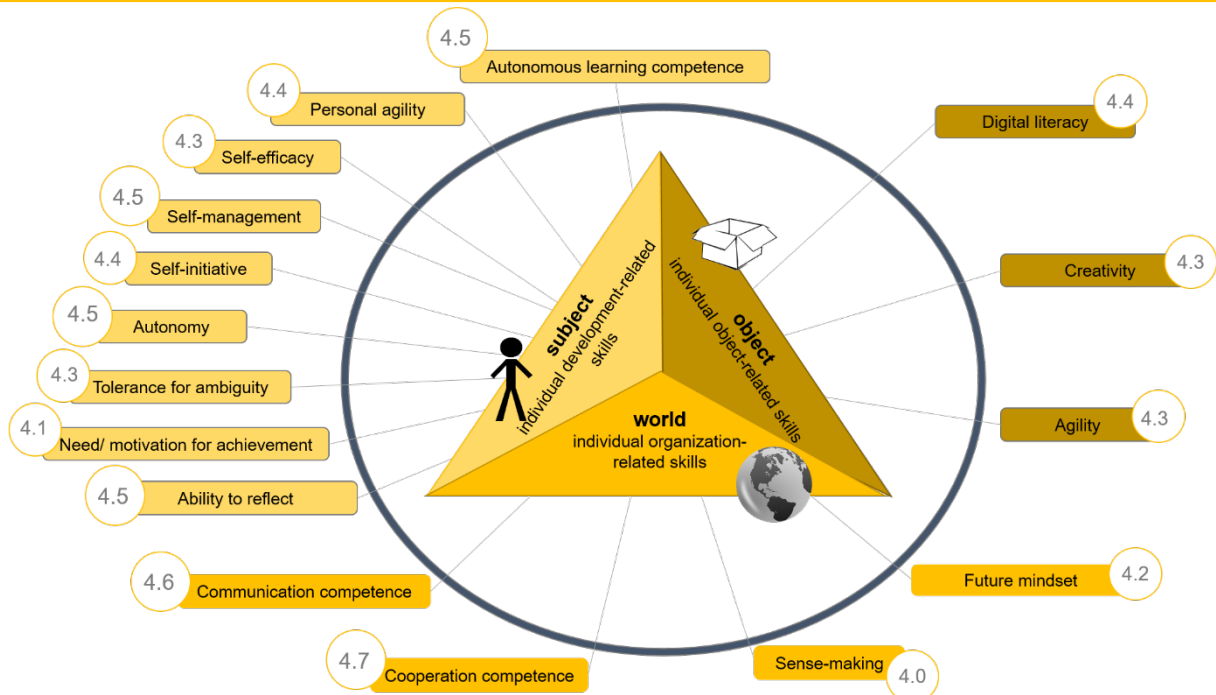


Figure 41. Overview on Future Skills and their importance (Mean values, different N)



## 7. Making it Happen: Nine Recommendations for the Future Skills Strategy in Higher Education

In the last round of the two-part Delphi survey, participants were asked about their opinion on which steps would need to be taken in order for HEIs to support the development of the skills in question.

The qualitative comments were analyzed and are illustrated in figure 42. Nine areas for change were identified (HEI-internal as well as external ones). Following, we describe the changes deemed necessary for future skills to be trained in HE.

- I. First, it became apparent from the experts' suggestions that a cultural change within HEIs needs to happen (represented as the circular arrows in figure 42). This change includes raising stakeholders' awareness (of the students, academic staff, as well as the industry and policy makers) that a shift towards focusing on future skills is important. However, this change necessarily also includes a clear definition of future skills beforehand. Some respondents proposed to include mandatory modules intended to foster future skills into students' curricula independent of their respective program to ensure all students would have the opportunity to develop these skills. As regards students' curricula, it was further suggested that these should be redesigned in a bottom-up approach, considering stakeholders' needs. Whereas some experts see professors and other academic staff developing these skills with their students, others highlighted the role of special training centers that would need to be established or ramped up. For the group arguing that the academic personnel should take over this task, experts considered learning centers to be a helpful contact point that could not only provide guidance, but also support the dissemination of models and teaching styles supporting the development of Future Skills, as well as evaluating the success of such concepts and ensuring that quality standards would be met.
- II. In a similar vein, successful approaches should be made visible and communicated externally to foster broad-scale implementation (visualized by the megaphone in figure 42). One of the key problems identified within the current HEI culture concerned the dichotomization of HE into research versus teaching. Experts recognized these two objectives as equally important, but stated that currently, recognition would mainly be based on publications and the success of research projects. Thus, they argued that good and innovative teaching should be much more incentivized.
- III. Finally, as regards the HEI's cultural change, experts advocated for including digital resources more strongly into their infrastructure, teaching, and learning (depicted by the laptop in figure 42). However, in order to benefit from digitalization, respondents stressed that the academic staff needed to be trained and equipped with both, the skills and the knowledge to find their way in digital HEIs.
- IV. Another important factor for better supporting future skill development within HEIs concerns assessment methods (check mark in figure 42). Experts stated that the "training to the test" would need to be replaced by new methods to assess not only whether students could memorize facts, but also whether they could apply what they had learnt and were able to demonstrate certain skills. Moreover, one respondent stressed that new methods would need to be found, which allowed for recognizing prior achievements.

- V. Motivating the academic staff, providing trainings, and guidance in general, and raising their awareness for the importance of developing future skills was identified as another key element (teacher symbol in figure 42). In addition, it was highlighted that staff should not only be hired due to being a pioneering researcher. Maintaining a balance between being a good researcher and an equally good teacher would be of vital importance here and would be a first step towards alleviating the dichotomization of academic work into research versus teaching (see above).
- VI. Hand in hand with training the academic staff, the experts also advocated for a different approach towards teaching and learning. Replacing teacher-centered by student-centered learning approaches was bottom-line, as well as a plea for developing “the whole person” instead of training for qualifications (visualized by the learner symbol (head with gears) in figure 42). More specifically, the sample identified group work, life-like and real-life community projects, project- and context-based learning opportunities as beneficial for supporting future skills development. Furthermore, more room for reflection, being creative and approaching tasks with interdisciplinary approaches were deemed essential. Yet, for these formats to be feasible, group size would need to be limited. In seminars with often more than forty participants, or lectures with a few hundred students, such project-based learning approaches would not be possible.

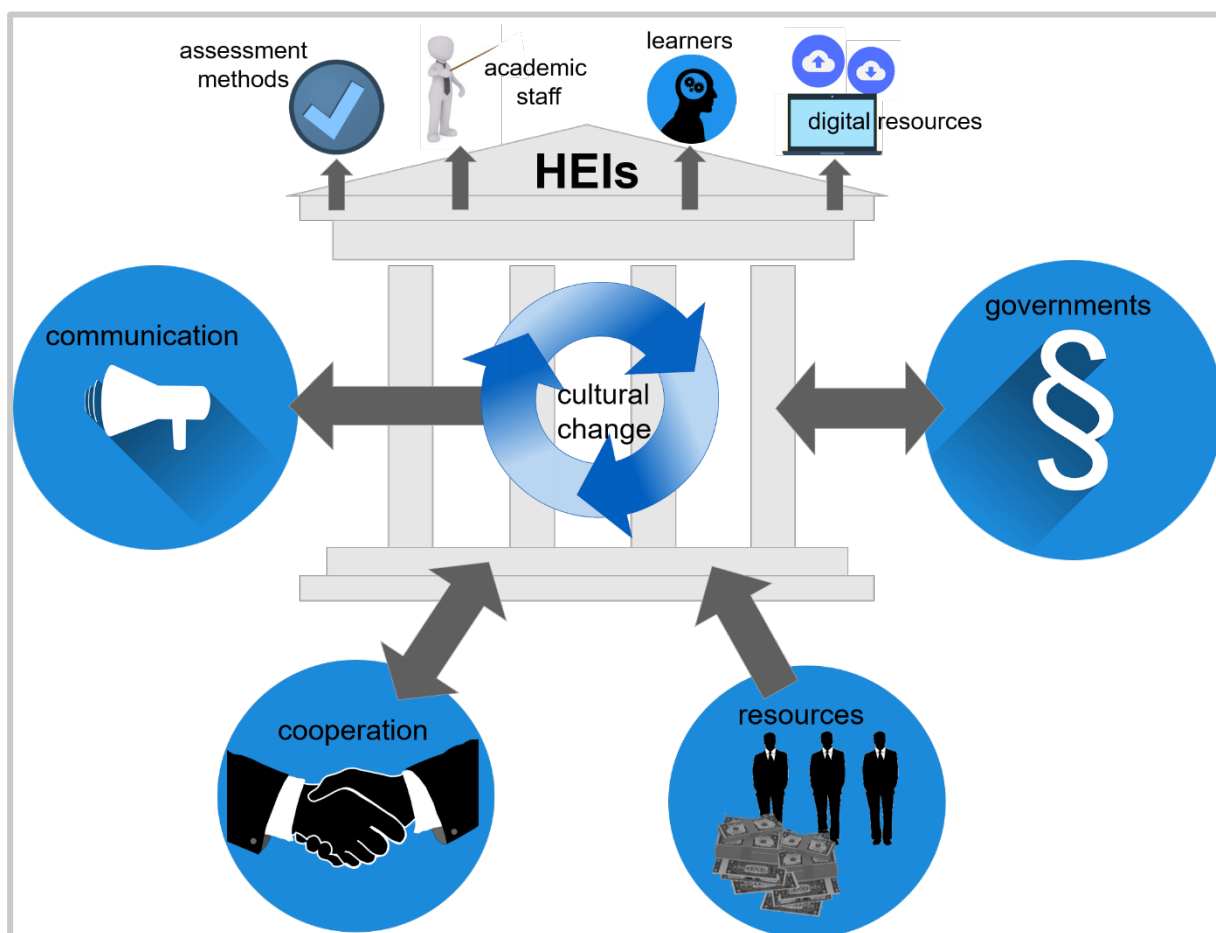


Figure 42. Identified factors of a framework to support future skill development

- VII. Generally, students and teachers should be brought together more closely to intensify the learning experience. However, this will only be possible if resources can be stocked up: more funding and more personnel are the key factors identified by the respondents to allow for a more favorable student-teacher-ratio (this is represented by the circle containing money and personnel in the lower right corner of figure 42).
- VIII. Apart from resources, the panel identified governments as another key factor as represented by the section sign in figure 42. In order to divulge new concepts and models supporting future skills more widely, the expert panel votes for integrating these into national evaluation assessments of HEIs and make them an explicit part of national HE strategies. Whereas some experts supported the idea of standardized approaches within and also across institutions, others demanded to be careful with any standardization as it could stifle innovation and potentially limit or interfere with flexible teaching models and the freedom of teaching.
- IX. The last external factor, represented by the handshake in figure 42, is cooperation among HEIs, but also between HEIs, industry, and governments. For instance, respondents wished that faculties would need to look outside their own HEI, reaching out to organizations in order to gain insights into actual skill needs, and cooperatively set up an action plan to move the future skill development into the spotlight. According to the experts, a first step might be to adopt an Erasmus+-like scheme to distribute and establish cooperation among all stakeholders, from the industry, governments as well as the educational sector.

## Info Graph: Future Skills for Future Higher Education

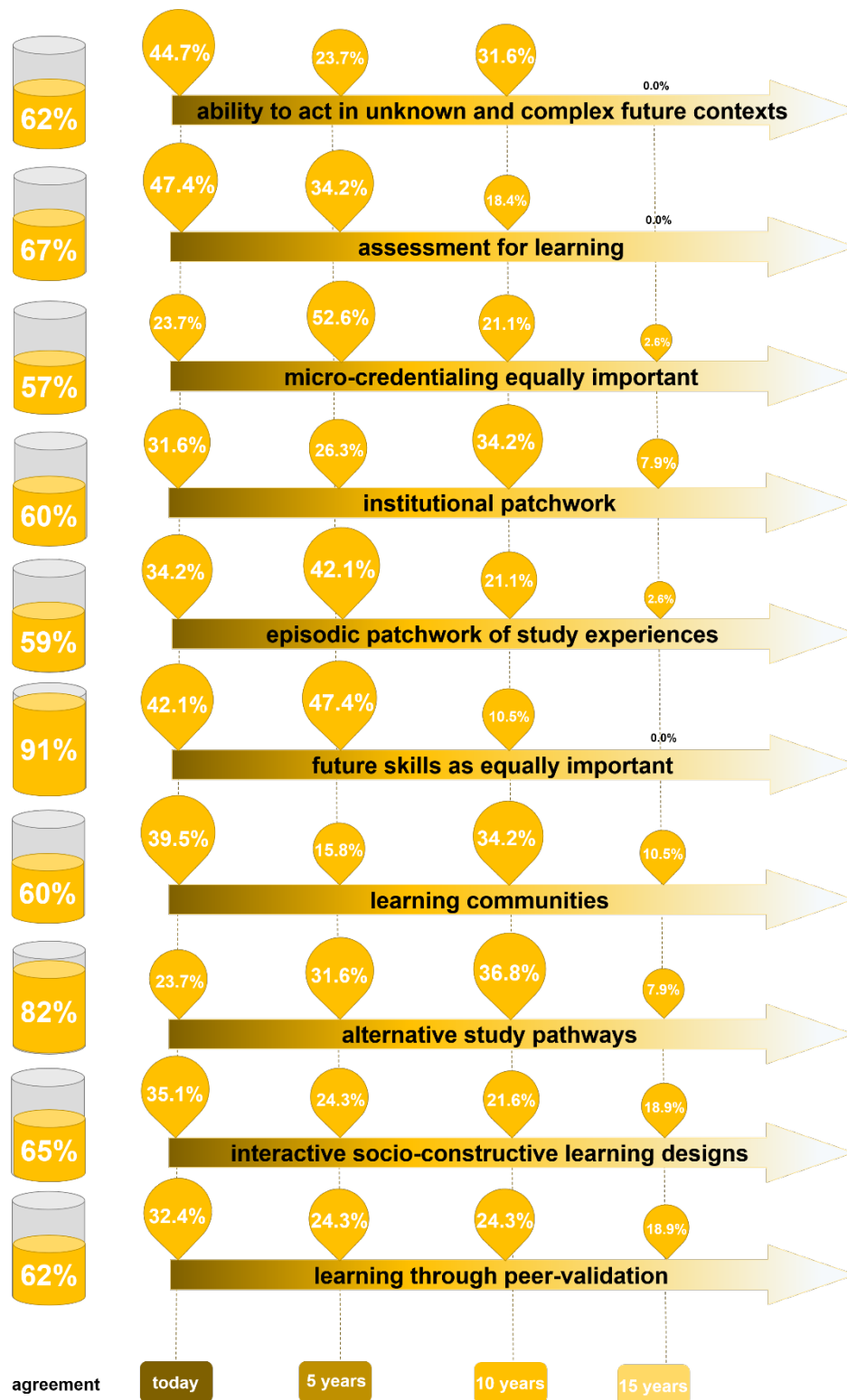


Figure 43. Overview on agreement levels and adoption times of the organization of higher education in the future (N = 38)

## 8. Conclusions and Final Remarks

Starting from the current lack of agreement on how HE will develop in shape, nature and organization in the future in order to meet the demands of tomorrow's future workplace and society, this report seeks to state clearly which drivers of change in HE will become relevant in the near and further future, how HEIs will develop driven through these "pillars of change", and gain clarity on the description of future skills and their nature. The intense interaction with international experts, who participated in this Delphi in two iterations made clear that there is no unanimous consensus – and as research team we neither expected this, nor did we think that it should be possible. However, the report shows clearly that – whichever scenario for HEI's development one focusses at – a radical advance will have to be made in order to arrive from the current situation of today's HE at the position of each respective scenario. We can draw the following conclusions.

With regards to future skills we can conclude:

- I. Future skills can be analyzed and described as a set of profiles, each containing an array of skill definitions covering future skill demands.
- II. These skills can be referred to as future skills and can generally be described through two cornerstone characteristics: a strong, transversal and well-developed ability of self-organization, which is mutually supported through a high-articulated supposition to act under conditions of uncertainty. Proficiency in any profession in the future will entail these two traits.
- III. Future skills can be described within a model, which is structured into three dimensions: subjective – individual development-related, objective – task and subject matter-oriented, social – organizational and environment-related. All three dimensions interact with each other and are not sole expressions of isolated skill domains. Subjective aspects influence the outlook on objective aspects as well as social aspects impact subjective and objective aspects.
- IV. The future skill approach presented here is going beyond a static model of listing a set of defined skills. It is going beyond digital or technical skills which will – no doubt – carry high importance for the future workforce but represent just one ingredient. The specific value of the presented future skill approach lies within the combination of focusing on the development of dispositions to act in a self-organized manner in the respectively described domain with a defined array of skills.
- V. The first future skill dimension is the subjective dimension of future skill profiles. It is relating to an individual's subjective, personal abilities to learn, adapt and develop in order to improve his/ her opportunities to productively participating in the workforce of tomorrow, actively shaping the future work environment, and involve him-/herself into forming societies to cope with future challenges. It contains seven future skill profiles.

- VI. The second future skill dimension relates to an individual's ability to act in a self-organized manner in relation to an object, a task or a certain subject matter-related issue. It emphasizes a new approach, which is rooted in the current understanding of knowledge but is suggesting to take knowledge several steps up the ladder, connect it to motivation, values and purpose and impregnate it with the disposition to act in a self-organized fashion within the knowledge domain in question. It is not just a quest for more knowledge but for dealing with knowledge in a different way, which is resulting into professionalism and not merely into knowledge expertise. This dimension houses five future skill profiles.
- VII. The third future skill dimension is relating to an individual's ability to act in a self-organized way in relation to his/ her social and organizational environment, as well as to the society. It emphasizes the individual's dual role as the curator of his/ her social portfolio of membership in several organizational spheres while at the same time taking over the role of rethinking organizational spaces and creating organizational structures anew to make them future-proof. It contains an array of four skill profiles.

In relation to future learning we can conclude:

- I. Higher education institutions in the future will provide a learning experience, which is fundamentally different than today's model. Adoption timeframes vary, but the Delphi experts estimated a short or mid-term timeframe for many aspects
- II. The dimensions of future learning in HE will comprise structural aspects, i.e. academic learning as episodic process, between biographical phases professional and private episodes throughout life, learning as institutional patchwork instead of the current one-institution-model, supported through more elaborated credit transfer structures, micro-qualifications and microcredentials, as well as the aspect of pedagogical design of academic learning, i.e. changing practices of assessment, also peer-validation, learning communities, focus on future skills with knowledge playing an enabling role in interactive socio-constructive learning environments).
- III. In general, the experts estimate structural changes to become relevant much later than changes related to academic learning design.

Concerning the future of HE we can conclude:

- I. Four key drivers in the HE-market can be described. Each driver has a radical change potential for HEIs, and together they mutually influence each other and span the room in which HE will likely develop.
- II. There are two content and curriculum related drivers (i.e. (1) personalized HE, and (2) future skill focus), and two organization-structure-related drivers (i.e. (1) multi-institutional study pathways, (2) LLHL).
- III. The profile, shape and nature of HE in the future will be most probably a certain pattern of configuration along the impact that each of the four key drivers – called “pillars of change” – has, and will influence the development of HE strategies.
- IV. The Delphi survey made a point to view future HE from a student's perspective and envisioned future learning experiences. Four scenarios for future HE can be described as gravitation centers of organizational development: (1) the future skill

university scenario, (2) the networked multi-institutional study scenario, (3) the my-university scenario, (4) the lifelong higher learning scenario.

- V. The experts estimated that the adoption time for three out of four scenarios would only become reality in more than ten years from today. Only the lifelong higher learning scenario was suggested to become relevant already within the next five years.

The report collected recommendations from experts expressing their view on how obstacles, barriers and other factors hindering uptake of the different future scenarios and key drivers could be overcome. We turned them into a nine-step recommendation for future HE strategies. The recommendations express good practices and important issues to recognize when future skills in future HE shall become an even more profound reality than they represent today.

Finally, with this report, the room for development of HE in view of the drivers has been elaborated. Whilst a majority of experts participating in the panel have expressed high levels of agreement and underlined the relevance for the presented scenarios, there was also disagreement as to the nature and direction of future developments. The experts' opinions as such represented a very balanced view on the different options of development. During the Delphi process we have therefore made an effort to incorporate the feedback from experts in order to gain the most balanced picture. Still, it is clear that none of the scenarios will be the blueprint for the future university, but it has also become clear that most of the presented future developments are realistic options of future HE development according to the experts.

In this way, the Delphi survey spans the room for development in which HEIs will evolve in the future. It contributes to the current approaches to define future skills with a more structured model, which is based on the three dimensions of education, the subject, the object, and the social environment.



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## Annex A

### *Expert participants in the Delphi*

Grateful acknowledgement is made to the following scholars and practitioners, who graciously shared their time and expertise as expert members of the Delphi panel, as well as to four additional participants, who wished not to be named:

Name	Job description	Institution
Nicolas Apostolopoulos*	Project Lead	Freie Universität Berlin Center for Digital Systems
Deborah Arnold	International and national projects coordinator	Université Numérique Économie Gestion
Ferran Badia	Vicerector	University of Lleida
Anne Boyer	Professor in computer science	Université de Lorraine
David Campbell	Researcher (Quality Enhancement Expert and Quality Researcher)	University of Applied Arts Vienna
Alastair Creelman	E-learning specialist	Linnaeus University
Gottfried Csanyi	Didactic Consultant	Technical University Vienna
Jacques Dang	Technology Director	HEC School of Management
John Daniel	Chancellor	Acsenda School of Management
Stefan Delplace	Honorary Secretary General	EURASHE (European Association of Institutions in Higher Education)
Maja Dragan	Researcher	Fachhochschule Joanneum
Florence Ducreau	Professor	Université de Lorraine
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Johannes Haas	Head of Degree Program	FH Johanneum
Jürgen Handke	University Teacher	University of Marburg
Guy Haug	Advisor to the Rector	Universidad Politécnica de Valencia (UPV - Valencia University of Technology)
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Davor Orlic*	COO	Knowledge 4 All Foundation	
Attila Pausits	assistant professor, head of centre for professional training research and education management	Danube University Krems	
Armando Pires	Full Professor; Vice-President of EURASHE	Instituto Politécnico de Setúbal; EURASHE (European Association of Institutions in Higher Education)	
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David Smith	Head of School of Education	Charles Sturt University	
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Ferenc Tatrai*	Senior advisor	EDEN European Distance Education and E-Learning Network	
Anne Thilloßen	Scientific Associate and Director of e- teaching.org	Leibniz-Institut für Wissensmedien	
Sophie Touze*	President	Open Education Consortium	
Brikena Xhomaqi	Director	Lifelong Learning Platform	

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*Note.*

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\*Participation only in the first round.

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## Annex B

Delphi Questionnaire Round 1:

*Round 1 asked participants to assess the relevance of scenarios and statements about future skills, studying and learning and higher education in the future.*

To access Annex B, please follow the link:

[https://nextskills.files.wordpress.com/2019/03/2019-03-Future-Skills-Delphi-Annex\\_B.pdf](https://nextskills.files.wordpress.com/2019/03/2019-03-Future-Skills-Delphi-Annex_B.pdf)

## Annex C

Delphi Questionnaire Round 2:

*Round 2 asked participants to evaluate the speed of adoption of scenarios and statements about future skills, studying and learning and higher education in the future, which had been presented in the first round, and were reformulated according to participants' qualitative remarks afterwards.*

To access Annex C, please follow the link:

[https://nextskills.files.wordpress.com/2019/03/2019-03-Future-Skills-Delphi-Annex\\_C.pdf](https://nextskills.files.wordpress.com/2019/03/2019-03-Future-Skills-Delphi-Annex_C.pdf)